

## HORTICULTURAL ABSTRACTS.

VOL. IV.

DECEMBER, 1934.

No. 4.

**Abstracts.** Initiated abstracts in the present number are by W. A. Bane, J. L. Edgar, R. J. Garner, W. S. Rogers, H. Wormald.

### INDEX OF CONTENTS.

HORTICULTURE—MISCELLANEOUS	Nos. 506-513
TREE FRUITS, DECIDUOUS	514-542
General	514-516
Varieties, Breeding	517-519
Propagation	520
Rootstocks	521-522
Root growth	523-524
Growth, Nutrition	525-532
Pollination	533-537
Cultural Practice	538-542
SMALL FRUITS, VINES, NUTS	543-555
PLANT PROTECTION OF DECIDUOUS FRUITS	556-585
VEGETABLE GROWING	586-600
FLOWER GROWING	601-605
CITRUS AND SUB-TROPICALS	606-620
TROPICAL CROPS	621-668
STORAGE	669-676
PACKING, PROCESSING, FRUIT PRODUCTS	677-687
NOTES ON BOOKS AND REPORTS	688-696

# Horticultural Abstracts

Vol. IV

December, 1934

No. 4

## HORTICULTURE—MISCELLANEOUS.

506. OHIO.

634/5

**Horticulture at the Ohio agricultural experiment station, Wooster.***Spec. Circ. Ohio agric. Exp. Sta., 45, 1934, pp. 51.*

The aim of this publication is to bring together in convenient form the more important practical results achieved by the horticultural department of this station, and it certainly forms a most useful summary in tabloid form. Pages 1-32 concern fruit growing problems:—pollination, spraying, cultural practices, breeding, small fruits. The vegetable work is noted on pages 34-47, being mainly on tomatoes and cucumbers under glass, and on potatoes in the open. Finally a section on floriculture, pages 48-51, deals very shortly with a variety of problems including the effect of limiting daylight on annuals. Although trials at this station are evidently planned and carried out with the aim of solving local problems, the data obtained are in many cases of considerable interest to all deciduous fruit growers. This summary, while giving the chief conclusions which may be drawn from certain trials, contains also a list of bulletins issued by the station, in which the particular investigations may be studied in greater detail.

507. PATERSON, D. D.

519 : 581.084.2

**A note on the value of correlation and regression in statistical analysis.***Trop. Agriculture, 11 : 160-9 and 220-9, bibl. 4.*

In *Tropical Agriculture*, Vol. X, Nos. 10, 11 and 12, there appeared a previous paper by the above writer entitled "Experimentation and applied statistics for the practical agriculturist", which was intended as an elementary guide to the agricultural student who wished to analyse his experimental results statistically. The present paper widens the field of information in respect of correlation and regression in statistical analyses. These terms are defined in the first half of the paper, and examples are given showing how the co-efficients of correlation and regression may be calculated from experimental data of a simple kind, several different methods being clearly described and illustrated by examples. Methods of testing the significance of differences between means of parallel series are then discussed, and described in detail by means of examples. In these a description of the analysis of variance method is included. The second part of the paper concerns itself mainly with a discussion on the utility of uniformity trials in field experiments. The variation in soil fertility is one of the greatest difficulties in obtaining conclusive results from experiments. This may be partly eliminated by modern methods of plot lay-out, but the plot variation may still be so great as to mask the real differences between treatments. By means of preliminary uniformity trials the potential yielding ability of each plot may be determined and the experimental yields adjusted thereby. This method is described and illustrated by means of two simple experiments. The uses of the regression co-efficient and the analysis of co-variance are shown here. In conclusion the writer suggests that this paper should be used as an introduction to the more technical literature on the problems discussed. J.L.E.

508. BRADFIELD, R. AND OTHERS. 631.4 : 634.1/8  
**Soils in relation to fruit growing in New York. Part IV. The significance of the oxidation-reduction potential in evaluating soils for orchard purposes.**  
*Bull. Cornell agric. Exp. Sta.*, 592, 1934, pp. 27, bibl. 9.  
 Thorough field examination of the soil profile can disclose extreme conditions of slow subsoil drainage. But in many cases yields are evidently reduced by some unfavourable soil condition, which cannot be disclosed merely by such an examination. It was felt that a study of the state of oxidation of the soil by means of the oxidation-reduction potential might be of value. A simple technique was devised and is here described. It was found that (1) fairly stable and reproducible potentials could be obtained in several soil-electrolyte suspensions, (2) that the potential was an approximately linear function of the pH value of the suspension except in very acid media. By a study of their oxidation-reduction potentials in the early spring months it was found possible to eliminate 80% to 90% of the poor orchard sites. The sites concerned were not extreme soil types but were similar in profile to one another and the success achieved under such circumstances appears to warrant further investigations along these lines. [From authors' summary.]

509. HAAS, A. R. C. 631.8 : 581.14 : 634.1/7  
**Growth response of tree tops relative to soil treatment.**  
*Calif. Citrogr.*, 1934, 20 : 36.  
 It has been found that when unfavourable chemical phases of soils have been corrected so that freshly planted trees will grow well in them, trees which have been in occupation of the land prior to its amelioration will often remain unhealthy. An example of this is cited and photographically illustrated. A case is mentioned in which some walnuts affected by yellows responded readily to applications of copper sulphate to the soil while others made no response. It is supposed that the root systems of the latter were too damaged to avail themselves of the chemical. Again in experiments with date palms at Riverside Experiment Station palms which failed to respond to the addition of chemicals to the soil were found to have damaged root systems. Tests suggested to diagnose whether failure to respond to favourable soil changes is due to an impaired root system are the planting of young trees, the injection of chemicals into the trees, the spraying of the top with chemicals or the inarching of trees under certain conditions.

.510. HEATH, O. V. S. 631.425  
**A simple apparatus for measuring the compactness of soil in the field and some results obtained in a cultivation experiment.**  
*Emp. J. exp. Agric.*, 1934, 2 : 205-12, bibl. 5.  
 A conical point 2·3 cm. diameter and 5·4 cm. long is driven vertically into the soil by impacts from a weight of 765 gm. falling 3 ft. down an iron stem  $\frac{3}{8}$  in. diameter and 6 ft. long screwed into the cone. The weight strikes on a tube 1·6 cm. diameter and 45 cm. long sliding on the stem. The blow is thus transmitted direct to the point. The depth of the point after each impact is measured against an adjustable scale held on a tripod at the upper end of the stem. Results are quoted showing significant differences between the mean impacts per cm. of penetration for different cultivation treatments.  
 W.S.R.

511. KELLEY, W. P., AND BROWN, S. M. 631.415.3  
**Principles governing the reclamation of alkali soils.**  
*Hilgardia*, 1934, 8 : 5 : 149-77, bibl. 30.  
 The authors discuss the work of Hilgard and later investigators. In alkali soils soluble sodium salts tend to bring about replacement of calcium by sodium, so producing chemical and physical conditions which are very adverse to plant growth. The reclamation of such soils depends on the removal of the soluble salts and the replacement of the absorbed sodium by calcium. The two Russian terms "solonetz" and "solonchak" signifying the two classes of alkali soils are explained. Very roughly in their original sense solonetz denotes an alkali soil containing a relatively low content of soluble salts, while solonchak denotes one high in soluble salts. The

authors suggest, however, that solonetz should be used to denote alkali soil containing replaceable (absorbed) sodium, the profile of which presents certain morphological structures. Investigations on the reclamation of the black alkali soil of the Fresno area of California and of the white alkali soil of the Imperial Valley are described. The Fresno soil contains much replaceable sodium (60% or more of total replaceable bases) and can be reclaimed excessively slowly by simple leaching or more satisfactorily by the application of gypsum or sulphur. The Imperial Valley soil, which contains practically no replaceable sodium can be effectively reclaimed by simple leaching. The authors conclude that before attempting to reclaim alkali soils the following points must be considered: drainage conditions, composition of the soluble salts, the content of replaceable sodium in the soil, the nature and content of the calcium minerals of the soil, the composition of water available for irrigation.

512. SITZ, M. 631.67  
**Some general problems in the arrangements of water supply plants.**  
*Hadar*, 1934, 7 : 190-2.

The following questions are dealt with from the point of view of conditions obtaining in Palestine—The choice of a site—Comparative advantages of a dug-out and a deep-bored well. A dug-out well here means a well dug down to water level and then bored. If the water level is high, a dug well is preferred because it is more permanent and it allows of a wider choice of machinery. With a high water level there is little difference in cost between the two operations. With a deep water level, boring from the surface is best owing to the difficulty in reaching the machinery at the bottom of a deep well in case of a breakdown.—Utilization of well as a spring or through a filter. Unless a spring is struck fairly early in the operation it is better to use a filter than to continue expensive boring with success uncertain. The disadvantages of a filter are discussed. The remainder of the article considers the various types of pumps and the best and most economical methods of using them.

513. GABRIEL, B. 634.1/8 : 337  
**Los derechos aduaneros, las medidas sanitarias y cuotas en el comercio internacional de frutas. (Customs regulations, sanitary measures and quotas in international fruit trade.)**  
*Rev. B.A.P.*, 1934, 17 : 204 : 41-5.

The purpose of this article is to show how the Argentine fruit export trade is affected by the regulations of importing countries and the measures to be taken to counteract the losses to the exporter which have generally resulted. In the case of Great Britain, Argentine fruit exports are still in the experimental stage but show a reduction in 3 years from 2,250 tons in 1931 to 1,146 tons at the present time. This is attributed to high tariffs and Colonial preference. Trade with the British Dependencies is chiefly influenced by the sanitary regulations which will not allow the admission of fruit from certain districts.

The following also are noted:—

SALMON, E. S. **Two new hops, "Brewer's Favourite" and "Brewer's Gold".** *J.S.E. agric. Coll., Wye*, 1934, 34 : 93-106, bibl. 16.  
SALMON, E. S. **Seventeenth report on the trial of new varieties of hops.** Publ. by East Malling Research Station, 1934, pp. 16, 6d.

#### TREE FRUITS, DECIDUOUS.

##### *General.*

514. PHILLIPS, H. T. 634.1/7  
**The reduction of orcharding costs.**  
*J. Dept. Agric. W. Aust.*, 1934, 11 : 404-6, bibl. 2.

It is pointed out that with the price of apples at its present low level and with the probability that there will be no increase for some years any reduction possible in the cost of production may be of vital importance to the grower. Only the problems which can be controlled by the

individual orchardist are here considered. These are divided into production costs and packing costs. Production costs can be dealt with (1) by an actual reduction in expenditure on a given area, (2) by an increase in the yield per acre. No. 1 is already probably at its lowest limit. No. 2 can be achieved by the elimination of all trees which do not do their share, and by their replacement either by top grafting or by fresh trees. In younger orchards the aim should be to attain complete uniformity as regards both size and symmetry. Extra tillage is needed in most orchards. A comparatively small increase in the total yield will enormously reduce the cost of production per box. A strong case is made for the withholding of all second-grade and undersized fruit from the home markets [such fruit cannot be exported.—ED.]. Attempts to market these grades often result in an actual debit to the grower besides lowering the price which might have been obtained for the top grades. Used as stock feed they would probably return at least 6d. a case. Packing costs allow of most scope for economy. The author describes in detail a packing plant and shed designed by himself which brings within the reach of the small orchardist the labour-saving principles and synchronization of the various phases of the process that have given such startling results in large factories. He claims that with this system it has been found possible to handle double the quantity of fruit with the same staff and less labour.

515. SOLIANIKOFF, P. 634.11-1.547 : 519  
**Studies on the methods of choosing samples of fruit for the determination of their commercial qualities.** [Russian-English summary.]  
*Publ. Crimean Zonal Exp. Sta. for Tree and Bush Fruits, 1932, pp. 31, bibl. 10.*  
 An attempt was made to determine what number of apples a sample should contain in order to ensure reliable results. Samples varying from 10 to 100 were taken and only little increase in accuracy was noticeable due to increasing the sample above 20. The author recommends using samples of not less than 25 apples. All determinations actually made were based on samples of 50. Pressure testers modelled on those used in America were employed and such significant results as were obtained went to confirm Palmer's results in Canada. [Full translation available.]

516. CONDIT, I. J. 634.37  
**Fig culture in California.**  
*Circ. Calif. agric. Ext. Serv., 77, 1933, pp. 69, bibl. 15.*  
 After touching on the introduction of fig varieties from the old world and the once controversial subject of the necessity for caprification in the Smyrna fig the writer deals in a practical manner with the general and particular cultural operations which are found most successful under Californian conditions for the six chief commercial varieties now grown there. These are in order of commercial importance:—Adriatic, Calimyrna (the name denotes that it is the Smyrna fig grown in California), Kadota, Mission, Turkey and Brunswick. The effects of climate and of soil are discussed. Propagation is almost entirely by woody cuttings, bud sports being extremely rare and of negligible importance. Pruning is dealt with in some detail for each variety and other practices such as topworking, caprification, irrigation and cultivation are adequately treated. Picking, packing, storing and preserving by drying are discussed, and a few practical hints are given on the control of the more serious pests and diseases. Notes on the utilization of the final product are followed by a consideration of the economics of production and costs in the fig industry.

#### *Varieties, Breeding.*

517. BOBONE, A. 634.63  
**Ensaio sobre a caracterização das variedades da oliveira. Estudo biometrico. (Characters of olive varieties. A biometrical study.)**  
*An. Inst. sup. Agron. Lisboa, 1934, 6 : 1 : 45-115.*  
 This is an attempt to evolve a standard method by which olives may be classified and identified. Habit of growth of the whole tree and of its branches and date of flowering must also be taken into account, but in this study only the leaves, fruit and stones are dealt with. In leaves the

points to observe are :—the length of the petiole and the midrib, the maximum breadth above or below the middle of the midrib, comparative lengths of petiole and midrib, leaves flat or curved, characters of the veins. In *fruits* :—weight, volume, length and greatest breadth, and ratio between the last two, length of peduncle, and its correlation with longitudinal axis and with volume, the shape of the basal depression, the shape of the apex, whether rounded, or acute, the terminal point if any, colour, shape, markings and colour of markings. In *stones* :—weight, volume, length and breadth and correlation of the two latter, straightness or curvature of the longitudinal axis. In *seeds* any special features of the striatures should be noted, their number apparently not affording a valid test. A further point to be determined is whether any correlation can be established between the length of the fruit, the peduncle, the leaf and the branches, and the shape of the tree. Where the particular character lends itself, numerous measurements have been made and subjected to statistical analysis, and it is on the differences so established that the system of classification is based.

518. MOFFETT, A. A.

634.13 : 576.312.32

*Cytological studies in cultivated pears.**Genetica*, 1934, 15 : 512-8, bibl. 14.

The author describes the technique employed in his examination of 15 pear varieties. The following were found to have a chromosome number of  $2n = 34$  :—Conference, Beurré Clairegeau, Beurré Giffard, Beurré Hardy, Beurré Superfin, Dr. Jules Guyot, Durondeau, Doyenné du Comice, Fertility, Marguerite Marillat, Williams Bon Chrétien, and the following of  $2n = 51$  :—Beurré d'Amanlis, Beurré Diel, Catillac, Pitmaston Duchess. Among the above Kobel had found chromosome numbers of  $2n = 45$  and  $2n = ca 46$ , in the case of Beurré Diel and Beurré d'Amanlis respectively. The present author found both of these to be triploids and he suggests the probability that Kobel's counts were confused by the presence of univalent and trivalent chromosome associations and that the varieties reported by him as aneuploids are really triploids. He summarizes as follows :—"Secondary pairing occurred at metaphase of meiosis in diploids, but no multivalents were observed. In triploid varieties, associations higher than trivalents were not observed. The lower degree of secondary pairing in pears as compared with apples indicates a greater degree of differentiation of the chromosomes in pears. It is considered that the evidence points to 7 being the primary basic number, and not 8 as suggested by Sax."

519. FLEMION, F.

631.52 : 634.11 + 634.25

*Dwarf seedlings from non-after-ripened embryos of peach, apple and hawthorn.**Contr. Boyce Thompson Inst.*, 6 : 205-9, bibl. 3.

For breaking the pericarp of peach and hawthorn seeds a machine was used in which a lever operates an eccentric shaft, so that a plunger breaks the coat at the lower point of eccentricity and is thereby mechanically prevented from crushing the embryo. The process was as follows :—*Peach*.—The pericarp was removed, the embryo soaked overnight in tap water, the inner coat peeled off and the naked embryo placed in moist peat moss at  $25^{\circ} C$ . Germination, 80-90%, took place in 5 to 7 days. *Apple*.—The same process was adopted. Only some 20% of the embryos germinated without after-ripening. *Hawthorn*.—Here slightly more preparatory treatment with tap water was necessary, after which the hypocotyls developed in about 10 days. With all three plants all seedlings were originally dwarfed and abnormal in appearance but gave rise later to what were apparently normal plants.

*Propagation.\**

520. SUIT, R. F.

634.11-1.541

*The wedge graft as a means of controlling overgrowths at the union of nursery apple trees.**Phytopathology*, 1934, 24 : 1086-1100, bibl. 10.

Melhus, Muncie and Fisk (*Ibid.*, 18 : 127-8, 1928, Abst.) and Muncie (*Rept. Iowa Hort. Soc.*, 63 : 204-6, 1928), found that wedge grafts tended to reduce callus knot. This led to the studies

\* See also 608, 626, 635, 636, 638.

detailed here with regard to the comparative value of the different methods of piece root grafting of apple trees from the standpoint of strength of graft unions, stand of trees and location and freedom from callus knot. Three types of graft were employed, namely wedge, whip-and-tongue, and double-tongue; half of each were wrapped with waxed string and half with nurseryman's tape. Grafts were subjected to breaking strains at the union after being allowed to callus for one month. The mechanical strength of tape-wrapped grafts was greater than that of grafts wrapped with string. It was, moreover, observed that twice the force was required to break well-made grafts as against those which were poorly fitted. Neither type of graft nor kind of wrapping appears to have affected the stand of trees, but tape-wrapped grafts produced a higher percentage of clean trees. Under conditions of drought the whip-and-tongue grafts gave the highest final stand while the double-tongue grafts gave the lowest. The tape-wrapped wedge gave 90·3% stand of clean trees as against 86·5% and 85·4% for whip-and-tongue and double-tongue grafts respectively. In every case a higher percentage of clean trees was obtained by using the wedge graft. This increase varied from 5 to 18%. The callus knots occurred chiefly on the scion lip and side union in the whip-and-tongue grafts and at the side union in the double-tongue and wedge grafts. [The callus knots appear to have arisen wherever the cambial tissue was exposed. It is interesting to note that 10% of the callus knots on wedge grafts occurred on the apical shoulders of the piece root.—Abstractor.] It may be noted that in the wedge graft no growths of the rootstock arose from the shoulders of the rootpiece during the first two years after grafting. The author points out that this has been one of the objections to the wedge grafting of piece roots. It is claimed that the evidence presented justifies the recommendation of the wedge graft, wrapped with tape, for the control of overgrowths at the graft union.

R.J.G.

*Rootstocks.*

521. CUMMINGS, M. B., AND OTHERS. 634.23-1.541.11  
**Rootstock effects with cherries. Seed and phytos propagation.**  
*Bull. Vt. agric. Exp. Sta.*, 352, 1933, pp. 36, bibl. 14.

The authors record the result of 10 years' trials of the comparative growth and yield of Early Richmond and Windsor cherries on roots of mazzard, Mahaleb, serrulata and pennsylvanica. Virginiana and serotina were also tried, but the unions made were so poor that they were excluded from the long-term trial. The stocks used for the stock trials were apparently mostly, if not all seedlings, but no indication of their source is given, nor is any account taken of possible seedling variation except with certain Early Richmond seedlings. No indication is given of the planting arrangements of the stock trial nor of any statistical aspect such as error. The number of trees used would appear to have been meagre, the tabulated results being obtained from 1, 2 or 3 trees on seedling stocks. That part of the paper, however, which deals with propagation is of considerable interest. Propagation by seed was studied. Much of the seed available proved to be poor. Flotation in alcohol, ether and salt solutions was resorted to as a means of segregating good and bad seed, but was not generally successful as many heavy seeds failed to germinate. Germination in general was poor [possibly owing to flotation?—ED.]. Unfrozen seed normally grew as well as frozen, while prolonged drying proved injurious. A rest period was found to be essential to seed, the embryo being developed satisfactorily only when the fruit was over-ripe. Propagation by stem cuttings in different media and at different temperatures was not successful. Propagation by layering was quite successful, the following methods being adopted:—(1) "Heeling in" method by which 2-year-old trees were set in a nearly horizontal position, only part of the branches being above soil. Nitrogenous manuring was carried out. (2) Bench layering—this was not satisfactory. (3) Pot layering—here 6-inch flower pots were halved vertically and wired over 2- and 4-year-old branches. Each half-pot was filled with some suitable medium such as garden loam, sand, etc. Good plants were obtained but with rather crooked tops. It was found that rooting of branches by this method was more likely to occur when the plant was growing vigorously than at any other time. (4) Nursery layering. Success was obtained here by setting the trees deeply with their tops nearly 2 ft. below ground

level. At the end of the second year many short roots had formed and at the end of the third fine sets of roots had developed, which afforded a rich source of root cuttings or roots for grafting. (5) Trunk constriction. This was successful with deeply set trees, root formation above the wire being induced by wiring tightly round the boles. Propagation by root cuttings was very successful, the best material being pieces of  $\frac{1}{2}$  inch in diameter of a light brown colour and about 6 inches long. If cut in autumn such pieces could be stored in sand and peat during the winter at about 40° F. New side roots formed in a month after setting out of doors. It was found possible to get trees on their own roots by deep planting or by the use of piece root cuttings derived from layers.

522. RAWLINS, T. E. AND PARKER, K. G. 634.23-1.541.11-2.19  
**Influence of rootstocks on the susceptibility of sweet cherry to the buckskin disease.**

*Phytopathology*, 1934, 24 : 1029-31, 1 ref.

The most conspicuous symptoms of this disease are on the fruits, which are more or less conical, shrivel just before maturity and have short pedicels. In the autumn a red colouration occurs on the leaves along the base of the midrib and extending out along the lateral veins. It is found that sweet cherries on Mahaleb escape or resist natural infection with buckskin. If, however, such trees are grafted with diseased Napoleon scions, they become very chlorotic. Unlike scions on mazzard and morello stocks they rarely exhibit the fruit symptoms described above. When diseased and normal scions were placed on different branches of Mahaleb seedlings the diseased scions became very chlorotic, but the infection did not extend to the normal scions.

#### *Root growth.*

523. SUSA, T. 634.11 : 581.144.2  
**Studies on the distribution of apple roots and methods of cultivation.** [Japanese-English summary.]

*Jap. Min. Agric. Lit. agric. Improvements*, 81, 1934, pp. 207-28, bibl. 20.

Twenty-five apple trees of ages varying from 1 to 35 years were excavated from 4 different soils. The varieties included Jonathan, Delicious, McIntosh Red and Ben Davis, all grafted on *Malus Sieboldii* rootstocks. The spread of roots was much greater than that of the branches. A root extension of  $\frac{1}{2}$  to 1 m. per annum was noted, causing roots to be distributed over the whole orchard in 5 to 6 years. The maximum root spread found was 13 m., and the maximum root depth was 2.5 m. No correlation was found between the direction of roots and branches, or between branch height and root depth. Different soils greatly affected the root distribution. In a light gravel loam with a water-table 13 m. deep an 8-year-old Jonathan tree had a root weight distribution as follows:—0-30 cm. deep, 79%; 30-60 cm. 19%; 60-180 cm. 2%; and the figures for a 35-year-old Smith Cider tree were, 0-30 cm. 66%; 30-60 cm. 28%; 60-120 cm. 4% and 120-240 cm. 2%. Root killing was noted in cases where the water-table rose to 1 m. from the surface in early spring. Clean cultivation with manures broadcast over the whole soil area gave better root distribution and better cropping than cultivating only a small circle round the tree, which restricted the absorbing root area. W.S.R.

524. FUJIMURA, J., AND YASUDA, R. 581.144.2 : 634.1/8  
**Studies on root systems of fruit trees grown in sandy soil.** [In Japanese.]  
*J. hort. Ass. Japan*, 1934, 5 : 69-101, bibl. 29.

1. The soil used in all the investigations described here was coarse sand (over 55%) over a particularly light subsoil. The permanent wilting points were 1.35% in the top soil and 1.32% in the subsoil. Only few bacteria were present ranging from 349,000 per 1 g. soil at 30 cm. to 41,000 at 90 cm. depth. The underground water-table was at about 1 m. during the growth period, but fluctuated greatly, being easily affected by rain. When rain had not fallen for more than 20 days in summer, soil moisture was about 4% in the top soil, 3% in the subsoil and 6% where the area of humus was fairly deep. The depth of the top soil and the humus layer of the

subsoil varied in different sections even within a short distance of one another. 2. The material for the trial, which was carried out by the "block" method, consisted of 1 tree each of 6- or 7-year-old loquats, figs, pears, and persimmons, 3- or 4-year-old chestnuts and vines and 4 trees each of 3- or 4-year-old peaches, and in addition to this a separate experiment comprised 8 trees each of 9-year-old peaches and pears. 3. The loquats were fairly shallow rooted and the area of the root system was small. The parts underground were very small compared with the above-ground parts. The figs showed a root system spreading widely over the surface of the ground, the underground parts being large in comparison with the parts above ground. The pears showed a high moisture requirement and great susceptibility to the presence of humus. Unlike the other species under trial which had many fine roots close to the main stem, the pears were well provided with fine roots, but these were not close to the stem. Persimmons and chestnuts were deep rooted, the underground portions being larger than those above ground. Vines showed well developed roots in the top soil and characteristically sent down deep roots when there was humus in the lower layers. Peaches were comparatively shallow rooted, but in soil poor in humus their roots showed greater penetrative power than those of pear. They were, however, less tolerant of underground water than pears. 4. Though most of the roots were found below the branch spread, the area of the root system always greatly exceeded that of the branches. The underground part was much greater than that above ground. 5. In sandy soil fruit tree roots are confined to the top soil, but if the lower layers contain humus capable of retaining water, the roots will penetrate there too. 6. At the depth to which the underground water rose for 4 days in summer no peach roots were found with a diameter of more than 5 mm. Persimmons and chestnuts were more tolerant of underground water than peaches. Pears were found to be deeply rooted despite the fact that their roots were submerged for a long time. 7. Abnormal roots having a swollen cortex were found in peach and pear trees. Roots growing weakly in the subsoil tended to show this character. 8. A certain number of dead roots were found with a diameter of more than 5 mm., but a comparison of pear, peach and fig roots showed the greatest mortality among pear roots of a diameter of less than 1 mm. Peach roots came next, while figs showed the greatest adaptability with only few dead roots. In the case of pear and peach, the greater the depth and the farther from the stem the higher was the rate of root mortality. 9. As the lateral roots of pears are liable to die, the main roots are found to be rod-like, while peaches have densely growing fine roots close to the stem. The fine roots of pears grow at some distance from the stem, but it was also found that vigorous root regeneration from the root tip occurs. 10. Observations made on root annual rings suggested that peach roots grew 2·5 m. a year. It was impossible to make any such surmise from pear roots. 11. The humus in the sandy soil had considerable influence on the development of the root system and therefore of growth above ground. [Authors' summary.]

#### *Growth, Nutrition.*

525. FIKRY, A.

634.22-2.19

#### **Water-table effects. 1. The gumming and death of plum trees.**

*Bull. Minist. Agric. Egypt, 141, 1934, pp. 35, bibl. 8.*

An account is given of observations made on plums of different known varieties grown on mariana, myrobalan, peach and apricot rootstocks in a plantation situated between the Rosetta branch of the Nile and the Rayah Menoufi Canal. The soil is light clay and rather permeable. The plantation is divided into 5 equal divisions each of which is divided again into 8 equal small plots. In each of the smaller plots are 14 plum varieties worked on the 4 rootstocks named above, which means that each variety is repeated 40 times on each of the stocks. Accurate surveys were made in December 1930 and again a year later and the incidence of disease noted tree by tree. Results are tabulated and graphed. Of the rootstocks [which were presumably seedlings.—ED.] mariana showed the highest degree of resistance, myrobalan was much less resistant and the other two were extremely susceptible. Scion resistance also varied considerably. A close correlation was established between scion and stock with regard to resistance,

the resistance of the stock increasing that of the scion. Relative resistance of the different combinations remained pretty constant in the second year, in which an increase of about 30% was remarked in affected trees. It was noted that mariana was shallow rooting while myrobalan and apricot were comparatively deep rooting. The water-tables were examined by sinking tube wells 2 to 4 metres deep, the borings being made with soil augers, the diameters of which were slightly larger than that of the tube well points. Data obtained from these showed that resistance to gumming was much lower where the water level was highest and most marked where the level was lowest. It is suggested that the disease may be controlled in Egypt by deep draining and may be prevented to some extent by using resistant varieties worked on mariana (i.e. a shallow rooting stock).

526. KARMARKAR, D. V.

634.11-1.84 : 581.192

**The seasonal cycles of nitrogenous and carbohydrate materials in fruit trees.***J. Pomol.*, 1934, 12 : 177-221, bibl. 49.

Special plots have been in existence at Long Ashton since 1920 for the purpose of examining critically the effects of time of application of manures especially nitrogen on behaviour of fruit trees. Already in 1930 the main practical effects of nitrogen deficiency on fruit trees had been summarized by Wallace (*Ann. Appl. Biol.*, 1930, vol. 17, p. 649). Swarbrick and Naik showed in 1932 (*J. Pomol.*, vol. 10, p. 42; *H.A.*, 1932, 2 : 2 : 130) that certain features of rootstock effect are related to characters which suggest carbohydrate/nitrogen relationships. The investigation described in the present paper concerns the nitrogen cycles within the terminal shoots of 2 sets of Newton Wonder apple trees growing on Malling type II stocks in this plot where the effects of two cultural systems are being examined, viz. clean cultivation and grass culture plus an annual spring dressing of nitrate. The results show clearly that total nitrogen and certain fractions thereof, especially of the water soluble non-protein portion, exhibit definite cycles associated with certain phases of seasonal growth, and that the cultural treatments affect the nitrogen conditions within the trees. Samples of terminal shoots, 50 to 60 in each case, were collected at monthly intervals from March 1932-March 1933, between 10.30 and 11.30 a.m. on each occasion. They were divided for analysis into wood, bark and leaves, and the following points were noted :—mean length of shoots, total dry matter of shoots and of wood, bark and leaves, total water soluble materials, total nitrogen, protein N and non-protein N, fractions of non-protein N, including nitrate, ammonia, acid amide, humin, basic, imide (including mono-amino acid) and rest N. In all three portions of the shoots these constituents exhibited definite seasonal cycles. The forms of the cycles in wood and bark were often similar but differed in the leaves. Autumn migration was demonstrated by data from leaves and bark. The application of nitrate in March to trees under grass did not affect the form of the nitrogen cycle and the data indicate a higher nitrogen status within the trees on arable than in those on grass. The exact methods of estimating the various constituents are detailed including the taking and preparatory treatment of samples and chemical analysis. Results are tabulated, graphed and discussed in detail.

527. BAKER, C. E.

634.11-1.542 : 581.12

**Water conductivity in the apple tree as affected by pruning and drought.***Abstract of Ph.D. thesis submitted to Illinois University*, 1933, pp. 18, bibl. 34.

The experiments referred to here were made in a 20-acre orchard of Grimes and Jonathan apple trees planted 1913 and 1914, a 9-acre orchard planted in 1906 including Jefferis, Grimes, Jonathan and Ben Davis, and lastly the variety orchard at Urbana containing 77 varieties, planted in 1917. In addition several small trees of Winesap, Maiden Blush and Jonathan were grown in the greenhouse and used for determining the effect of drought on water conductivity in 1- to 3-year-old branches or stems. The data on which the following conclusions are based do not appear in detail in the abstract. The author summarizes as follows :—(1) Pruning wounds in older apple trees result in desiccation and heartwood formation. Longitudinal extension. The latter is rapid in seasons of extended drought. (2) The water content of the wood in the apple remains

almost constant except in the vicinity of pruning wounds (or like injuries) and in periods of drought. (3) Withholding water from young trees results in plugging the vessels, which is a condition of heartwood formation, and reduces water conductivity. Plugging in the vessels in the wood of any one year takes place first in the oldest wood; in stems more than 1 year old, plugging takes place in the oldest annual ring first and then in each succeeding annual ring. (4) A rather slight decrease in the water content of the wood in apple trees caused serious plugging and browning below pruning cuts and in unpruned stems. In this experiment a 10% reduction of the water content was sufficient. (5) The rapid heartwood formation at Olney in years of extreme drought may suddenly limit the water available to the foliage, if the succeeding growing seasons are unfavourable for a rapid formation of new wood. Because not all trees succumb at once, the ultimate cause of the condition cannot be attributed to dry weather alone, but is produced by a combination of variables, many of which must be found in the relationship of the soil to the tree and the environment. (6) Heartwood formation in the apple in Illinois is normally the result of desiccation in the summer.

528. NIGHTINGALE, G. T., AND MITCHELL, J. W. . . . . 581.13 : 634.11 + 635.64

**Effects of humidity on metabolism in tomato and apple.**

*Plant Physiol.*, 1934, 9 : 217-36, bibl. 23.

The effects of relative humidity on apple are in harmony with the responses exhibited by tomato when subjected to similar conditions of humidity. The tomato plants, of the Bonny Best variety, were selected from a population of about 700 and were uniform in size, quality and appearance. The experimental apple material consisted of carefully selected 24-inch whips of the Rome variety propagated in the nursery as whole root grafts. Both were grown in sand cultures under controlled conditions. *Tomatoes*.—The sand was kept at 49% of saturation throughout and the temperature at 70° F. In the lot grown at 35% air humidity carbohydrates were relatively high and the cell walls were thick. There was a fairly high concentration of total organic nitrogen but much of it was in the form of complex insoluble protein. Comparable plants at 95% humidity were a darker green and higher in chlorophyll. Carbohydrates were relatively low and much of the organic nitrogen was water-soluble. *Apples*.—In the trees subjected to atmospheric humidity of 40% there was a tendency to carbohydrate accumulation and apparently to condensation of the simpler forms of organic nitrogen to complex proteins. In comparable trees at 95% humidity carbohydrates were found in relatively low concentration, there was less indication of protein condensation and cell walls were comparatively thin.

529. TILLER, L. W. . . . . 634.11-1.547.6

**The iodine-starch reaction as a test for maturity of apples.**

*N. Z. J. Sci. Tech.*, 1934, 16 : 88-101, bibl. 6.

This paper reports on the suitability or otherwise of the iodine-starch reaction for standardizing the picking maturity of some principal export apple varieties under conditions obtaining in the Government Research Orchard. The varieties tested were Cox's Orange Pippin, Jonathan, Delicious, Sturmer and Statesman. The solution used was 10 grammes potassium iodide and 2.5 grammes iodine dissolved in 1,000 c.c. of water. Staining could not be carried out until 18 hours after picking but this delay was found to cause no detectable loss of starch. The apples were cut equatorially and stained in iodine solution in shallow dishes for  $\frac{1}{2}$  minute. Photographs are given showing the effects on 10 fruits of each variety. *Cox's*.—There is no consistent inter-relationship between starch content and external appearance, iodine-starch reaction is therefore unable to determine fitness for picking. Its utility as a test for indicating the earliest date for picking is as yet uncertain. *Jonathan*.—The iodine test does not appear to be any more sensitive as an index than the current standards of which the chief is change in ground colour of fruit. Individual variation of fruit is so great that the effect of the time factor on the hydrolysis of the starch may be masked. It is just possible that the starch status may be more uniform earlier than the period covered by the tests, in which case the iodine test may be of some use in fixing the earliest date for picking. *Delicious*.—Samples taken at intervals from the 10th to

the 31st of March proved so indistinguishable in their starch contents as to render the test valueless. *Sturmer*.—There is a more uniform starch content of the fruit in the earlier stages, but there is considerable difficulty in judging the correct stage of starch disappearance. The matter is thus kept within the necessity for personal judgment and so scarcely improves on the common empirical methods. *Statesman*.—The starch disappears much earlier in the maturation of the fruit than in the case of the other varieties examined and had quite disappeared by the time of the first commercial picking. Extreme individual variability is shown and precludes any attempt to define the maturity of the variety in terms of starch content.

530. BROWN, H. P.

634.21-2.181

**Internal breakdown of apricots.***Agric. Gaz. N.S.W.*, 1934, 45 : 337-40.

An internal breakdown of apricots which occurred during ripening in the Murrumbidgee Irrigation Area has caused severe losses conservatively estimated at 50% of the crop. Affected fruits when cut open show a brownish discolouration of the flesh near the pit which extends out into the flesh and ultimately develops into a soft mushy rot. Affected fruits either fall to the ground or remain on the tree. In either case they exude a black viscous fluid and finally assume the form of dark brown, mummified bodies of irregular or globular form and pliable leathery texture. Where the dripping liquid touches the leaves, it causes a scald-like injury, thought to be due to an ex-osmosis, leading to the death of the cells. The disease is shown to be entirely distinct from brown rot, nor is the ammonium sulphate of the fertilizer treatments the cause, as some growers have thought. The evidence points to the attacks being brought about by excess moisture in a non-porous subsoil. Irrigation water in these subsoils is unable to drain rapidly away and if, as sometimes happens, there is an abnormally wet season the condition is intensified and severe outbreaks occur. Thus the stage of fruit maturity appears to be of outstanding importance.

531. MALLY, C. W.

632.19 : 634.1/7 : 632.951.8

**Raw linseed oil and seal oil for controlling irregular blossoming and foliation in fruit trees.***Bull. Dept. Agric. S. Afr.*, 125, 1934, pp. 23, bibl. 2, being *Fmrs' Bull.* 72, *Stellenbosch Elsenburg Coll. Agric.*

In view of the regulating effect of raw linseed oil on the apple tree in the Eastern Cape Province it was tested in the University orchards of Stellenbosch in 1928. Eight varieties of pear including Doyenné du Comice, Williams, etc., five of apples, and the prune California d'Agen were all sprayed rather late in the spring, i.e. 20th September, with different concentrations of oil including 5%, 7½% and 10%. As regards the pears, 4 weeks after application all the treated trees came into remarkably uniform leaf and blossom, whereas untreated trees in the orchard as a whole were very irregular in growth. The effect was extremely local, twigs and even buds which had been missed behaving like the unsprayed trees. The oil only served to normalize trees and not to force them into activity earlier than usual. At the close of the 1928 season the oiled trees showed sturdier fruit spurs and larger fruit buds than the unoiled trees. The setting of the fruit was so even that 90% was ready for the calyx spray at the same time. Apples were found to respond in the same way. Peach and nectarine trees have been found to respond to some extent, but so far the benefit has not been enough to make treatment economic. Japanese plums are found to respond much better than peaches or nectarines. The treatment was very successful at all strengths on the California d'Agen prune. As regards all the above the trees have now been sprayed annually for 5 years without ill effects. The oil is best applied in emulsified form, a convenient formula being raw linseed or seal oil (approximately same success got with this) 1 gallon, soap 6 oz., water 3 pints, NaOH 1 oz. For 5% spray dilute to 20 gallons. The spray should be applied as nearly as possible 4 weeks before the normal time for the blossoms to open. 5% solution has generally been found strong enough. It has been found, too, that both raw linseed and seal oil have a distinctly destructive effect on bud mite, woolly aphis, red scale and red spider.

532. MALHERBE, I. DE V.  
Little leaf or rosette of fruit trees.  
*Fmg. S. Afr.*, 1934, 9 : 312-3, 315.  
It is shown that in South Africa the application of about 4 lb. zinc sulphate per tree has resulted in great improvement in apple, pear and plum trees affected with little leaf. The method of application is to broadcast it or lay it in circular furrows round the tree. Zinc sulphate applied through holes bored in the trunk, though economical of material, may cause injury or death of the tree if not applied at the right time.

*Pollination.\**

533. NEBEL, B. R., AND KERTESZ, Z. I.  
Metaxenia and xenia in apples. IV.  
*Gartenbauwiss.*, 1934, 9 : 45-64, bibl. 38.  
634.11 : 575.18

Nebel here defines the term metaxenia as the variable influence, measured independent of fertility (seed number), of the male gamete on the tissues in proximity to the zygote and the endosperm. He first considers the literature dealing with the subject, dividing authors into two classes, those having seen or thought to have seen or shown the existence of the phenomenon and those who consider it a myth or doubtful. The latter class is very small and is more or less confined to those who merely consider metaxenia to be non-existent in the genera worked on by them. The author then describes his own experiments. In these he crossed in 1930 Fameuse  $\times$  Yellow Bellflower and Fameuse  $\times$  McIntosh, 27 apples of each group being used for measurement. In 1931 the crosses were McIntosh  $\times$  Yellow Bellflower and M.  $\times$  Red Astrachan, 58 apples from the first and 63 from the second being used for measurement. In 1932 the crosses were the same but the apples were harvested at four different dates (average of 30-odd a time). In 1933 McIntosh was crossed with Red Astrachan, *Malus baccata* Borkh and *Malus atrosanguinea* Schneid., 74, 60 and 52 apples being harvested. These were analysed on seven successive dates with monthly intervals. The following particulars were taken and are tabulated here:—weights of apples; seed number, correlation of weight and seed number, regression value and significance; chemical determinations including comparative pH values, acidity, total sugars; seed size. The author concludes from the data here assembled that metaxenia certainly exists. He considers that Wicks' negative conclusions (*Ark. Exp. Sta. Bull.* 143, 1918) are not necessitated by that worker's measurements and that his results might well be resubmitted to critical examination. A possible reason why all investigators using limited data do not arrive at the same conclusion may be due to the fact that metaxenia does not always occur with the same frequency even using similar material. Thus in the author's experiments it occurs for weight in 6 out of 8 possible cases, for chemical composition in 4 out of 12 cases and in varying degree for other measurements. The theoretical conclusion is that the phenomenon exists but does not become manifest at all times. As regards the importance of metaxenia there are certainly more urgent problems awaiting solution, yet it is obvious that metaxenia does allow of improvement in the crop in a tangible way without any additional cost. Hitherto pollination work has not used statistical methods and has been primarily concerned with gross differences. As finer differences begin to be considered, so will metaxenia be studied as a practical problem.

534. KOBEL, F.  
Die Befruchtungsverhältnisse der Kirschen. (Cherry pollination.)  
*Flugschr. Mitt. eidg. Versuchs. Wädenswil*, 30, 1934, pp. 11.  
634.23 : 581.162.3

This consists of a list of the more important Swiss cherry varieties (63) with varieties in each case suitable for pollinating them.

\* See also 561.

535. BRITTAINE, W. H., AND NEWTON, D. E. 634.11 : 581.162.3  
**A study in the relative constancy of hive bees and wild bees in pollen gathering.**  
*Canad. J. Res.*, 1933, 9 : 334-49, bibl. 23  
 and,  
**Further observations on the pollen constancy of bees.**  
*Ibidem*, 1934, 10 : 255-63, bibl. 3.

An account is given in these two bulletins of observations made at Macdonald College, Ontario, and in King's County, Nova Scotia. Previous work on the subject is discussed in the first. The trials concerned constancy to apple blossoms and embraced both hive bees and solitary bees belonging to the genera *Halictus* and *Andrena*. In both series of observations the hive bee was found to be more constant than *Andrena* judged by the number of pure loads, while *Halictus*, which in the first series was more constant (but not significantly so) than the hive bee, appeared in such small numbers in the second series that no conclusions could be reached. The studies do not, however, indicate such a high degree of constancy in the hive bee as has been claimed by other workers, and availability of any particular bloom appears to be the main factor in determining the degree of constancy exhibited. It may be noted that species most commonly found on the apple are those showing the widest range of food plants.

536. NORO, K., AND YAGO, M. 634.13 : 581.162.3  
**Studies on sterility of the Japanese pear Chojuro with special reference to hand pollination, dehiscence of anthers and insect visitors.** [Japanese-English summary.]

*Bull. Shizuokaken agric. Exp. Sta.* 29, 1934, pp. 13, bibl. 10.

Better set of flowers was got by pollinating in the morning and the evening than during the rest of the day. On a cloudy or windy day many anthers dehisce during the day, but on days following rain they dehisce in the morning. There are indications that the work of pollinating insects may be helped by the erection of windbreaks. Notes are given on the actual visiting insects and on the particular times, if any, when their visits took place. [From authors' summary.]

537. NORO, K. 634.13 : 581.162.3  
**Studies on the hand pollination of the Japanese pear Chojuro as a means of good setting.** [Japanese-English summary.]

*Bull. Shizuokaken agric. Exp. Sta.* 33, 1934, pp. 16.

The following method was found to be an economic method of hand pollination. Flowers should be picked at noon, at which time many of the anthers naturally dehisce, and should be used at once on the flowers which need pollination. The picked flowers are then placed in a dry shallow container, when the unopened anthers will be found to dehisce. The same flowers can be used again. [From author's summary.]

#### *Cultural practice.\**

538. NIIZU, N., AND KADIURA, M. 634.25-1.542.27  
**Relation of time of thinning to fruit size, June drop and yield of peaches.**  
 [In Japanese.]

*J. hort. Ass. Japan*, 1934, 5 : 34-41, bibl. 7.

The experiments took place in 1932 and 1933 on four kinds of peach. The authors found that the earlier the thinning took place, the larger was the fruit, their observations differing from those of Dorsey in this particular. They suggest that this may have been due to the fact that they thinned much more heavily than Dorsey. They consider that under their conditions the

\* See also 508-11.

time available for thinning is shorter than that recommended by Dorsey [who considers thinning can be effectively done until 3 or 4 weeks before harvest.—ED.]. Thinning the crop slightly in advance of the regular thinning resulted in a larger crop and larger fruit than when this preliminary operation was omitted. Thinning before the "June drop" did not entirely eliminate this phenomenon. [From authors' summary.]

539. SAVASTANO, G.

634.63-1.542

Sperimentazione e potatura dell' olivo. (*Investigations on olive pruning.*)*Reprint l'Olivicoltore, 1934, vol. 11, No. 3, pp. 12, bibl. 26.*

The author considers in some detail the observations and recommendations of olive experts in Italy, the United States and elsewhere on the vexed question of olive pruning and discusses the conclusions reached and the reasons for these conclusions. Subject to the warning that pruning must necessarily vary with the soil, with habit of growth, with climate and with manuring he offers the following advice. (1) Recently planted trees not yet in bearing should be pruned very lightly. (2) Young trees which have just come into bearing should also be pruned lightly, just enough to shape the tree according to one's wishes, aiming at a strong, easily accessible tree of large framework. (3) The fully grown tree should be pruned moderately each year, enough to ensure adequate aeration of the branches and to correct faults in growth. Pruning cannot take the place of manuring. (4) When old or ceasing to bear well, trees must be pruned more strongly. Old useless branches should be eliminated and a chance given to young newly formed shoots to take their place. This must go hand in hand with abundant organic and inorganic manuring.

540. JACOB, H. E.

634.63-1.542

The effect of pruning in the training of young olive trees.

*Bull. Calif. agric. Exp. Sta. 568, 1934, pp. 26.*

The work reported here was in continuation of that reported by Bioletti ten years ago.\* Bioletti had found a very depressing effect on the growth of young olive trees resulting from both moderately heavy and very heavy pruning. The unpruned trees were, moreover, the first to come into bearing and their form was equal or superior to that of the pruned trees. The present author worked on Mission, Manzanilla, Sevillano and Ascolano trees, the four most important varieties in California. Summer pruning was limited to removal of shoots from the rootstocks and of water sprouts on the trunks. Five systems of winter pruning were tried, namely (1) Little or no pruning of branches until the tree reached bearing age. In the fifth season a light crop was borne. The following winter the trees were opened out by removing all main branches except 4-6 scaffold branches on each tree, thus leaving a hollow inverted cone. The lower half was thinned by removal of twigs or cutting back to laterals to prevent overbearing. In the sixth and seventh winters water sprouts were removed and the denser parts of the trees were thinned. (2) Same as (1) except that the very dense skirt of small branches on the lower part of the tree was thinned out the third winter. (3) Light annual pruning. Three to five branches were selected at the first or second winter pruning to form scaffold branches for the framework of the tree. Each subsequent year branches not wanted for the scaffold were shortened or removed. Surplus branches were generally allowed to remain if they did not interfere with the main framework. The skirt of lower small branches was lightly thinned each year. Thinning varied somewhat with variety. At the fifth pruning most of the surplus branches restrained previously by annual pruning were removed entirely. (4) Same as (3) but in addition mechanical means were used where thought desirable to hold the scaffold branches in position for a season or two. (5) Heavy annual pruning. At the first winter pruning 3 or 4 branches were selected for scaffold branches and the others were removed. The selected branches were cut back to 6 inches and had all their laterals removed. At the second and subsequent prunings all new branches and twigs starting from the trunk were removed and the growth on the scaffold branches was heavily thinned. Data were collected on the following points:—trunk girth, weight of prunings, estimated fraction of total foliage removed by pruning during first 3 years, height,

\* Pruning young olive trees. *Ibidem*, 348, 1922.

spread, crop weight, grade of olives forming crop. The trees left unpruned until 5 years old bore heavier crops in the fifth season than did the pruned trees. The crops in the sixth and subsequent years were about the same on trees of all varieties under all systems except severe pruning. These did not produce a commercial crop in 7 years. Artificial supports appeared unlikely to have permanent results. The form of the trees at the end of 7 years was not very different whether shaped by light annual pruning or by heavy pruning in the fifth, or fifth and sixth year. Artificial supports appeared unlikely to result in permanent improvement of the form of the tree. Response to pruning varied somewhat in the different varieties, and these differences are discussed.

541. REED, H. S.

634.21-1.542

**A sixteen-year experiment on apricot pruning.**

*Bull. Calif. agric. Exp. Sta.* 574, 1934, pp. 27, being *Paper 282 Univ. Calif. grad. School trop. Agric. Citrus Exp. Sta.*

Riverside, California, the site of the trial, receives its rain in the winter and spring. During the summer the temperatures and evaporation rates are high, necessitating careful irrigation. 280 trees of the Royal variety were planted in 1916 at a spacing of  $20 \times 24$  ft. and were divided into 14 plots of 20 trees, each of which consisted of 4 subplots of 5 trees. The aim of the planning was to equalize as far as possible the soil variation. Ten of the 14 were pruned, each by its own system, and 4 were left unpruned. The cultural operations other than pruning were as uniform as possible. Briefly treatments were as follows:—(1) Central shaft or modified leader type, heavily pruned summer and winter, (2) as in (1) but moderately pruned summer and winter, (3) vase type, heavily pruned summer and winter [This is a common type in Southern California.—ED.], (4) as in (3) but moderately pruned summer and winter, (5) as in (1) but without summer pruning, (6) as in (2) but without summer pruning, (7) as in (3) but without summer pruning, (8) as in (4) but without summer pruning, (9) vase type, girdled and moderately pruned in winter, (10) lightly pruned (long pruning), lightly pruned in winter. (11) Every fourth subplot was unpruned and acted as a control. The vase type developed the best mechanical framework. The largest yields were got from 3 plots pruned to form this type, two of them being winter pruned only, and one pruned each summer also. Yields on the central shaft type were larger where light summer pruning was done. The size and quality of fruit were best on trees which were systematically headed back, the large crops of fruit in the unpruned trees showing the poorest quality of all. At the end of the 16 years all trees were healthily growing. The largest average size of trees was found on plot 8, i.e. vase shaped, moderately pruned in winter only, and this plot showed also the largest average size of yield. Although the smallest trees were in an unpruned plot, the average sizes of pruned trees were in general slightly less than those in the adjacent-control plots.

542. BONNET, J.

634.63-1.55

**La cueillette mécanique des olives. (Mechanical picking of olives.)**

*Rev. Vitic. Paris,* 1934, 81 : 245-8.

Harvesting an olive crop may be carried out in three ways—by hand picking, by beating with a pole, by allowing the olives to drop naturally. The two latter methods although usually only employed when the size of the tree makes hand picking difficult, are most undesirable. There are two types of mechanical pickers. One, operated by motor or hand, consists of a revolving cylinder with projecting wings of rubber or metal which strike the olives in rotating. The other is a simple rake or comb. A metal comb is also described which the author has found to be extremely efficient. The head of the comb is adjustable on the shaft so that it can be used at any angle and the space between the teeth can be regulated, a useful provision when the fruit is undersized. Any length of handle can be used and altered at will. Even if it is still necessary to use ladders, they do not have to be moved so frequently owing to the large area which can be reached by the comb. The speed of picking is greatly accelerated with more comfort for the pickers.

The following also are noted :—

TANAKA, T. On the cultivated distribution of fruit trees. [Japanese-English summary.] *Commun. hort. Inst. Taihoku Univ.*, 40, 1934, pp. 177-83, bibl. 20.

POTTER, J. S. The chromosomes of selected *Malus* species and crab forms. *Abstract of Ph.D. thesis submitted to Illinois University*, 1933, pp. 6, bibl. 5.

WHITAKER, C. W., AND LUNDSTROM, F. O. A review of the patents and literature on the manufacture of potassium nitrate with notes on its occurrence and use. *Misc. Publ. U.S. Dept. Agric.* 192, 1934, pp. 53, bibl. 64.

VENEZIA, M. Sulle relazioni fra gli enzimi e le alterazioni delle ulive e degli olii. (The relation of enzymes to deterioration in olives and olive oils.) *Ann. Ist. sup. agr. Portici*, 1933, 6 (ser. III) : 37-42, bibl. 9.

VENEZIA, M., AND OTHERS. Ricerche sulla lipasi delle ulive. (Investigations on lipase action in olives.) *Ann. Ist. sup. agr. Portici*, 1933, 6 (ser. III) : 43-51, bibl. 15.

VENEZIA, M. Sulla presenza della mannite nelle ulive. (On the presence of mannite in olives.) *Ann. Ist. sup. agr. Portici*, 1933, 6 (ser. III) : 52-5, bibl. 12.

MARINUCCI, M. 634.63-1.542

Potatura dell' olivo. (Pruning the olive.) Published by Federazione italiana consorzi agrari, Piacenza, 1934, pp. 50. A small illustrated manual for the olive grower.

### SMALL FRUITS, VINES, NUTS.\*

543. BUTTERFIELD, H. M. 634.7

Bush berry culture in California.

*Circ. Calif. agric. Ext. Serv.* 80, 1933, pp. 53, bibl. 15.

Berries are only a minor crop in California and there would seem to be little hope of their becoming more important, unless prices generally become higher, since growers in the Pacific North-West can produce larger crops of equal quality. For those wishing to grow such fruits, however, this should prove a most useful guide. It deals with the care, training and cultivation of raspberries black and red, logan and allied berries, currants and gooseberries, the appropriate fertilizers and their application, the common pests and diseases and their control, harvesting brambles and currants and gooseberries, packing and distribution.

544. ANDERSON, L. C. 634.722-1.8

Four years of commercial fertilizers on currants in the Hudson river valley.

*Bull. N.Y. St. agric. Exp. Sta.* 641, 1934, pp. 13.

The experiments were made in a solid planting of the red currant variety Diploma on a patch, part of which had been enriched by pig keeping on the particular site some ten years before the start of the experiments, and part depleted by full grown apple trees. The currants were kept under conditions of clean cultivation with a fairly good cover crop of weeds. They all responded to applications of nitrogen, there being no definite evidence that any one form of nitrogenous fertilizer was better than another. No benefit was apparent from the use of P or K either alone or in combination. The application of nitrogenous manures proved profitable on the rows previously enriched by pig manure, but where the soil had been depleted by full grown apple trees and cultivation was poor owing to the old stumps of the trees remaining, growth and yields were very poor even despite nitrogenous manuring.

\* See also 673.

545. VAILÈ, J. E. 634.75-1.8  
**The influence of environmental factors on the development of the pollen, pistil and fruit in the strawberry.**

*Abstract of Ph.D. thesis submitted to Illinois University, 1933, pp. 4.*

This abstract confines itself to a brief discussion of the data recorded in investigations carried out in the greenhouse and in the field on some 17 strawberry varieties under such varying conditions as to test the effect of shortening the daylight, varying nutrient conditions and irrigating. Actual figures are not given in the abstract but the following conclusions "seem justified from this study":—(1) The environmental and nutritional factors influence the development of the pollen, pistil and fruit in the strawberry. (2) The production of viable pollen and mature anthers is associated with low nutritional conditions and a long daily light period. (3) The production of normal pistils is increased by high nutritional conditions, a long daily light period, and irrigation. (4) Pistil abortion is associated with a reduction in the nuclear content of the embryo sac, which increases under conditions of low nutrition, a short day, and a lack of moisture. (5) The abortion of the pollen and pistils may be controlled, in part, by environmental and nutritional conditions. (6) The size of the plant, size and shape of the inflorescence, and size of the fruit are influenced by environmental factors.

546. SCOVILLE, G. P. 634.8  
**An economic study of grape farms in Eastern United States. Part I. Production.**

*Bull. Cornell agric. Exp. Sta. 605, 1934, pp. 50.*

This economic survey deals in turn with all the routine operations of successful grape farms in New York State, Michigan, and Arkansas and discusses the effects of particular soils, drainage, fertilizers, etc., on the return achieved. The pros and cons of each operation, of the small versus the large farm, of spraying and dusting and methods of speeding up these operations, of different methods of training, etc., are all dealt with, while finally costs and returns in 1928 and 1932 are compared and investigated.

547. OSKAMP, J. 634.8-1.4  
**Soils in relation to fruit growing in New York. Part V. The vineyard soils of the Westfield area, Chautauqua county.**

*Bull. Cornell agric. Exp. Sta. 609, 1934, pp. 18, bibl. 9.*

The type of profile found most favourable is a fairly light-textured soil varying only slightly in the top 4 feet, and showing a bright uniform shade of brown in the soil and subsoil which indicates a well-oxidized condition. Such a profile may be lacking in fertility which must therefore be made up. Where a clay horizon comes in at 2 to 3 feet with a highly mottled subsoil colour indicating poor oxidization, conditions are much less favourable for grape growing. This condition becomes intensified the nearer the clay comes to the surface.

548. BIOLETTI, F. T., AND WINKLER, A. J. 634.8-1.543-1.55  
**Density and arrangement of vines.**

*Hulgardia, 1934, 8 : 6 : 179-95.*

The vines used in the tests made from 1923 to 1930 were the strong growing Black Prince and the weaker growing Muscat of Alexandria. The soil was fertile, deep, well supplied with water and uniform. The densities and arrangements of planting represented with variations the commoner practices in use in California. The variations consisted of increasing the densities in the square planting system and in reducing the distance between the vines in the row with a corresponding increase in the distance between rows in the avenue system. Data collected were crop, trunk growth, weight of pruning, weight of vine at end of experiment. The results which show the influence of the variations on density and arrangement of the two vines are tabulated. *Density.*—The first crop in both cases varied almost exactly with the number of vines per unit area. With each subsequent crop up to 1928 the yield per vine and therefore per acre increased at all densities, but more rapidly for the wider spacings. In the 1925 crop the yield per acre of the 4 × 4 planting of Black Prince was 6·3 times that of the 12 × 12 and that

of the same planting of Muscat 8·0 times that of the 12×12. These differences, however, gradually diminished until in 1927-8 the corresponding ratios were 1·8 for the Black Prince and 3·1 for the Muscat. The wider spaced vines in all cases produced greater crops per vine and it seems probable that the differences in acre crop would in time disappear in the case of Black Prince. The results suggest that under Davis conditions, maximum crops of Black Prince would be obtained from vines planted 300 to 500 to the acre (12×12 = 303 vines per acre) while Muscat or other moderate growers should be planted about 600 to the acre to get maximum crops. *Arrangement*.—It was found that in the avenue arrangement too great a difference between the width of avenue and distance between vines in the row caused a considerable reduction in vine yield. Cordon pruning appeared to be valuable in neutralizing the reduction in early years. Arrangement by the avenue system restricted the crop for several years at least, and the more seriously the greater the departure from the square system.

549. SALIBA, F. 634.8-1.541.11  
*Les porte-greffes franco-américains en Algérie. (Franco-American vine rootstocks in Algeria.)*

*Rev. Viitic. Paris, 1934, 81 : 263-4.*

The Franco-American vine rootstocks Chasselas × Berlandieri 41B, Mourvédre × Rupestris 1202, Bourrisquou × Rupestris 93-5, Aramon × Rupestris Ganzin Nos. 1 and 9, were widely used in the Department of Oran as soon as their reputed virtues were known. The Departments of Constantine and Algeria were later in taking them up. 41B is always in demand for calcareous and dry soils. It can withstand a large amount of carbonate of lime without its scions becoming chlorotic. It is sufficiently resistant to phylloxera. The remainder did well for a few years but have failed to last.

550. GUZZINI, D. 634.872 +664.85.8  
*Uve tardive e serbevoli. (Late grape varieties and good keeping varieties.)*  
*Ital. agric., 1934, 71 : 806-17.*

Efforts are now being made to find varieties which will supply the Italian home market in autumn and early winter with grapes to compete successfully with foreign imports. The author discusses the factors which make both for late ripening and for good keeping. The latter depends on (1) specific characters in the vine, (2) climate where grown, (3) soil, (4) cultural systems, (5) storage methods. Among specific characters late ripening may be considered very important, while others are the form of the bunch, whether tight and compact or fairly loose, the latter type generally keeping the best; grape resistance to fungi; the attachment of grapes to the peduncle; the consistency of the grapes. Localities where wet autumns are the rule should be avoided. As regards soil the chemical composition would not appear to be very important, but the physical conditions should be such as to eliminate excessive humidity and to maintain a degree of freshness in times of drought. On cultural factors the author quotes Longo with approval. "To keep the grapes far removed from the ground especially when they are to remain on the vine, is essential to good keeping, the capacity for which, one may say, is in direct proportion to the height of the espalier, pergola or whatever may be used to support the vine." Thinning prevents excessive tightness of the grapes in the bunch, which is one frequent source of breakdown. Preservation methods.—The choice of the following methods, which are touched on briefly, would appear to depend on the variety in question and the means available for carrying them out. They are:—(1) preservation with fresh stalks (*a*) on the vine (protected by bags from insect and other damage), (*b*) by the Thomery method, i.e. with their stalks in water in a cool, equable store house, (*c*) in cold store; (2) preservation with dry stalks (*a*) in fruit store on racks, (*b*) in granulated cork, (*c*) by means of SO<sub>2</sub>. Varieties.—A large number are cited as offering distinct possibilities, but till they have been well tested the author advises the planting only of proved varieties such as Ohanes, S. Jeannet and Gros Vert, which have proved successful as late, well keeping varieties in Spain and France and are the actual varieties whose grapes are now imported late in the year. Other vines which may prove worth cultivating in this connexion are the Regina and the Pergolese di Tivoli.

551. RIVEROS, J. E. 634.873  
*'La pasa sin semilla de uva sultana. (Cultivation of seedless raisins.)*  
*Rev. B.A.P., 1934, 17 : 202 : 26-30.*

The cultivation of the seedless raisin in the Argentine should be extended, particularly as it now has to be largely imported. The principal raisin growing district is the Province of San Juan and here they use the smaller berries of the muscatel, a practice which entails the considerable expense of grading. This could be avoided if the seedless raisin were grown. A botanical description of the variety is given. It is resistant to *Oidium* and frost. A light soil, sandy for preference, is suitable. It is compatible with rootstocks Riparia × Rupestris 3.309 and Rupestris du Lot. The long pruning method should be used. Provided steps are taken to increase the size of the berries, it makes a good table grape with the added advantage that it is seedless. The remainder of the article contains detailed instructions on processes necessary to obtain the best results with this raisin.

552. LONGO, A. 634.872  
*Rilievi generali sulla tecnica degli allevamenti. (General notes on the cultivation of table grape vines.)\**  
*Ital. agric., 1934, 71 : 846-97.*

The author deals in general and particularly with the more important points of cultural practice. Thus as regards rootstocks he suggests stocks which are likely to suit some 40 varieties or hybrids grown for table grapes in Italy. He passes next to the soil and its preparation, then to consider the advisability of planting worked rooted cuttings or ordinary cuttings or unworked rooted cuttings, etc. He deals with budding and grafting, with irrigation, and at considerable length (30 pages) with the methods of training and pruning which are in his opinion best suited to early ripening varieties, varieties ripening normally and late ripening varieties. All the methods are described in detail and generally with the aid of clear illustrations, both diagrammatic and from photographs. He next discusses such refinements of practice as may not always be necessary but may lead to considerably better products, e.g. artificial pollination, berry thinning, ringing. Finally he touches briefly on what he considers to be the four chief impediments to successful table grape growing, namely *Peronospora*, *Oidium*, sparrows and wasps.

553. PROSPERI, V., AND OTHERS. 634.872  
*Comportamento delle varietà consigliate dalla commissione tecnica ecc.  
 (Behaviour of table grape varieties recommended by the technical commission  
 of the Fascist Agricultural Confederation.)*  
*Ital. agric., 1934, 71 : 733-80.*

Six varieties of table grapes and their performance under different conditions are here discussed. All except Bicane appear to be fulfilling expectations and to be satisfactory, provided their particular idiosyncrasies are provided for as regards cultivation, rootstock, etc. *Regina* (synonym possibly Dattier de Beyrouth).—Long pruning is recommended. It shows a distaste for Rupestris du Lot as a rootstock but otherwise is not particular, though vigorous rootstocks are preferable. *Italia* (Bicane crossed by Muscat Hamburg).—No lack of affinity has been reported with any common rootstock. Failure of fruit has occasionally occurred and further work on soils and pruning necessary for this variety would appear desirable. The large size of its white grapes and its taste make it a valuable variety. *Muscat of Terracina*.—Pruning should vary according to location. The choice of rootstock will also depend on soil, but so far at the Velletri and San Onofrio experiment nurseries the following have shown affinity:—Berlandieri × Riparia 420-A, Chasselas × Berl. 41-B, Rupestris du Lot, Rupestris Metallica. *Baresana*.—Thinning of berries is particularly necessary with this variety and leaf thinning is also strongly recommended. While not incompatible with any common rootstocks, its behaviour varies considerably with the particular rootstock on which it is worked. This variety has been submitted to irrigation with a fair measure of success and with less success to paper mulching. *Zibibbo* (synonym Muscat of Alexandria).—The Zibibbo is specially suited to dry warm climates. It makes no

\* Any particular part of this could be translated on request.—ED.

special cultivation demands, but prefers short pruning. It is equally suitable for use as a dessert grape or for drying. Compatibility with rootstocks varies with location and work on the subject has been done at Palermo where various Paulsen and Ruggeri hybrids originating in Sicily have been under trial for some years. Paulsen 877, 1045 and 1323 stocks have resulted in more regularly formed bunches. *Bicane*.—This is not entirely satisfactory owing to its tendency to coulure and millerandage.

554. DALMASSO, G. 634.872  
Uve precocissime ed uve precoci. (**Early and very early varieties of table grapes.**)

*Ital. agric.*, 1934, 71 : 781-805, bibl. 35.

The author describes some dozen white and an equal number of black grape varieties which ripen very early but on the whole are not otherwise of exceptional merit. He then describes at rather greater length a few varieties which do not ripen quite so soon but may definitely be described as early rather than late. These include a number of Hungarian varieties. Among the earlies the following are noted as specially deserving attention:—Panse precoce (W),\* Delizia di Vaprio (W) (Pirovano hybrid 46A), Chasselas doré (W), Chasselas rose (W), Chasselas moscato (W). The very early varieties do not yield such satisfactory products, but among them Perla di Csaba (W), Primus (W), the "true" Luglienga (W), the "true" Madeleine Angévine (W) and Precoce de Marseilles (B)† are perhaps the best.

555. EASTWOOD, H. W. 634.57  
**The Australian nut.**

*Agric. Gaz. N.S.W.*, 1934, 45 : 203-9.

*Macadamia ternifolia*, the Australian nut [or Queensland nut, see *H.A.*, 1934, 4 : 1 : 59.—ED.] is indigenous to the coastal parts of north-eastern New South Wales and Queensland. It is the richest oil yielding nut known, producing 76% of oil equal to the best olive oil. The shell contains 2·8% of oil. The husks contain 14% of substances suitable for tanning leather. Plantations as yet are few. It is a forest tree of the sub-tropics and health and yield are adversely affected by dry conditions. Shelter from wind is essential both on account of breakages and because exposed trees fail to bear well on the windward side. A wide range of soil types can be used but a deep friable fertile loam gives the best results. Propagation is at present by selected seed from thrifty, regularly bearing trees yielding well-filled, uniformly shaped nuts which come early to maturity. Nuts with loose kernels or of hemispherical shape will probably not germinate. Thin-shelled nuts though in a sense desirable usually have undersized kernels. Autumn sowing is best. Seedlings 6-12 inches high or 6-12 months old transplant fairly well, after which age they are difficult. Owing to the great variability of the nut vegetative propagation will be necessary if an industry is to be established. The tree has proved very difficult to produce by the ordinary methods of budding and grafting but can be easily propagated from layers. Prices for nuts in Australia range from 3d. to 9d. per lb. according to the venue of the market. The demand is unlimited.

The following also is noted:—

TALBERT, T. J. **Strawberry growing in Missouri.** *Circ. Mo. agric. Exp. Sta.* 176, 1934, pp. 20.

#### PLANT PROTECTION OF DECIDUOUS FRUITS.

556. CONDIT, I. J., AND HORNE, W. T. 634.37-2.8  
**A mosaic of the fig in California.**

*Phytopathology*, 1933, 23 : 887-96, bibl. 8, being *Paper 291 Univ. Calif. grad. School trop. Agric. Citrus Exp. Sta.*

The symptoms are a light yellow colour, which forms a mosaic pattern on the leaves varying in intensity and spread, malformation of leaves, and mosaic spots on the fruit similar to those

\* W signifies white variety.

† B signifies black variety.

found on the leaves. In serious cases the condition would appear to be responsible for the premature dropping of fruits. Of the 5 leading Californian varieties the Kadota and Calimyrna are least affected, the White Adriatic and Brown Turkey are little affected under good cultural conditions, while Mission is often seriously affected with resulting improper colouring of the fruit on drying. Only one variety in California, an entire leaf caprifig form of *Ficus palmata*, is found to be entirely immune. Preliminary results in the transmission of the disease from diseased to healthy trees by budding indicate the presence of a true mosaic disease. The search is being continued to find the vector or vectors, insects at present suspect including the Mediterranean fig scale (*Lepidosaphes fici* Sign.), certain species of thrips known to transmit fungus diseases, and the mite *Eriophyes fici* Ewing.

557. WILSON, E. E.

634.2-2.314

Bacterial canker of stone-fruit trees in California.  
*Hilgardia*, 1933, 8 : 3 : 83-123, bibl. 33.

In this investigation bacterial gummosis in stone-fruit trees is compared with the disease known as sour-sap. Gummosis is recognized by the exudation of abundant gum and by well-defined cankers. The sour-sap disease is characterized by the failure of branches or of entire trees to produce leaves in the spring, or the trees may start to grow but the foliage suddenly wilts after the first warm days; the bark of limbs and trunks is girdled by well-defined brown, moist, sour-smelling necrotic areas, and there is generally a lack of gum formation. These characteristics differentiate the two diseases at certain periods but not at others, and such factors as time and kind of stone-fruit appear to influence greatly the expression of the disease. Apricots, cherries and plums appear to be more susceptible to sour-sap than are peach and almonds. Isolations from sour-sap and from gummosis cankers yielded two types of bacteria, one producing a distinct green pigment on potato dextrose agar, the other no pigment. Inoculations proved that both types of bacteria were able to produce identical symptoms on plum, peach, apricot and cherry limbs; in certain instances the inoculations resulted in sour-sap cankers, in others gummosis cankers. The author finds that the green organism is *Pseudomonas Cerasi* Griffen, and considers that the white organism is identical with *Ps. prunicola* described by Wormald as causing a shoot wilt of plums in England. Since the two organisms causing gummosis and sour-sap are almost indistinguishable except by their colour, he designates the white organisms as *Pseudomonas Cerasi* var. *prunicola* n. var. After beginning activity in the autumn, established (hold-over) cankers continue to extend during winter and early spring; they become quiescent in late spring and remain so through the summer. Inoculations in early autumn and late spring produced only small lesions, those in late autumn and early spring extensive cankers.

H.W.

558.

RUDOLPH, B. A.

634.51-2.314

Bacteriosis (blight) of the English walnut in California and its control.  
*Bull. Calif. agric. Exp. Sta.* 564, 1933, pp. 88, bibl. 107.

The author takes as an accepted fact that the loss of crop due to this disease in California far exceeds that of all other walnut diseases put together. Though here mainly concerned with results obtained in spraying experiments, he also gives information on the history and spread of the disease, the identity and character of the bacterium concerned, *Pseudomonas Juglandis*, and on methods of infection. Spraying with bordeaux mixture was found very much more efficacious than with any other preparations tested. These included highly refined oil emulsions, basic copper acetate, ammoniacal copper carbonate, acid, neutral and excessively alkaline bordeaux, semesan, uspulin, dip dust, neko, iodine, liquor cresolis compound, sodium fluosilicate, calcium chloride, potassium permanganate, zinc sulphate and quick lime. As a result of trials the author makes the following recommendations for spraying with bordeaux. They are based on observations and on experimental data obtained in different parts of California. Winter sprays are unnecessary and useless. The first application of bordeaux 8-4-50 should be given when the buds are expanding and some of the new growth has developed, but few or none of

the nuts have appeared. This spray is essential, subsequent sprays being valuable but only when regarded as auxiliary to the first. A second spray at full strength should be given as soon as possible after the end of the fertilization period. This is also a most important spray. A third spray may be necessary, if the weather remains damp and there is much fog and rainfall. If necessary it should be applied when the nuts are  $\frac{1}{2}$  to 1 inch in diameter. There is distinct indication that thorough spraying 4 or 5 years running results in a marked decrease in the incidence of the disease.

559. ZELLER, S. M., AND LUND, W. T. 632.452 : 634.71  
**Yellow rust of Rubus.**

*Phytopathology*, 1934, 24 : 257-65, bibl. 6.

The fungus is here identified as being identical with that known in Europe as *Phragmidium Rubi-Idaei* (DC) Karsten. The relative susceptibility of some 30 varieties of *Rubus* to the rust was tested in the greenhouse and results are tabulated here.

560. RUDLOFF, C. F. 632.42 : 634.11  
*Venturia inaequalis* (Cooke) Aderhold. I. Der Einfluss des Nährbodens auf den Pilz, u. die Erhaltung seiner Pathogenität. (*V. inaequalis*. 1. The effect of nutrient medium on the fungus and its pathogeneity.)  
*Gartenbauwiss.*, 1934, 9 : 65-91, bibl. 13.

A consideration of the results of experiments made to discover the best media in which the apple scab fungus can be cultivated for reinoculation purposes without loss of or change in virulence.

561. SHIMA, Z. 632.42 : 634.11 : 581.162.3  
**Relations between pollination and stigmatic infection of young apple fruits by Sclerotinia Malii** Takahashi. [In Japanese.]  
*J. hort. Ass. Japan*, 1934, 5 : 8-12, bibl.

A serious fruit rot of young apples in Japan is caused by the fungus *Sclerotinia Malii* Takahashi. The author has studied the progress of the infection and has obtained some experimental proof that the fruit rot follows infection of the stigmas by spores of the fungus. He has also studied the relation between infection and pollination. It was found that infection occurred most readily when inoculation was simultaneous with, or preceded pollination, and that the later inoculation occurred after pollination, the less was the degree of infection. The damage from infection following self-pollination is, as a rule, greater than that following cross-pollination. Stem rot may follow the fruit rot, but if the diseased fruits fall early the stem rot does not occur. In the control of this disease thinning and manuring are considered to be important. The cultivation of mixed varieties and the use of wind-breaks are recommended in order to encourage satisfactory and early pollination and so to reduce the chances of infection. H.W.

562. THOMAS, H. E., AND ARK, P. A. 632.314 : 634.13 : 551.56  
**Nectar and rain in relation to fire blight.**  
*Phytopathology*, 1934, 24 : 682-5, bibl. 6.

It has been noted that the dissemination of *Bacillus amylovorus* increases during wet weather. The authors found in these experiments that the nectar of blossoms grown in a dry atmosphere contains sugars in concentrations much greater than will allow the growth of the organism in culture solutions. This suggests that, although a limited amount of infection in wet weather may be due to rain splashes, the greater incidence of the disease is probably also closely related to the increase in volume and reduction in concentration of pear blossom nectar during such periods.

563. CURTIS, K. M.

632.314 : 634.1

**Fireblight. A survey of current knowledge and recent advances.***Reprint Orchard. N.Z., 1934, June 1st, pp. 8, bibl. 18, being Cawthron Inst. Myc. Publ. 10.*

Fireblight, *Bacillus amylovorus*, was identified at North Auckland in New Zealand in 1919-20. By 1932-3, possibly earlier, it had arrived in Nelson. A description is given of the organism and of how the disease may be recognized on the tree. In the tissues, whatever they may be, the bacillus selects the softest for its path. It overwinters in holdover cankers in branches and main limbs and also in the infected shoot. It is spread by a number of insect and other vectors and by infection of soil. It enters the plant through wounds and probably through stomata. Widespread infection occurs only when the host plant is in an actively growing condition. The pear is more susceptible than the apple, the Bon Chrétien and the Beurré groups being particularly susceptible, while Doyenné du Comice, Anjou and Winter Nelis offer slight resistance. The susceptibility appears, however, to vary somewhat with the season. Of varieties tested as stocks *Pyrus Calleryana* and *P. ussuriensis* have proved distinctly resistant to root and body blight as experienced in America. In New Zealand definitely recorded hosts include apple, pear, quince, hawthorn, medlar, loquat and *Pyracantha angustifolia*, pear and hawthorn being especially susceptible. Also under New Zealand conditions *Pyrus japonica* and *Kerria japonica* are the garden plants which need special watching as possible hosts. Control methods considered here are removal of infected parts, sterilization of wounds, and blossom spray for prevention of blossom blight.

564. SHAW, L.

632.314 : 634.11

**Studies of resistance of apple and other rosaceous plants to fireblight.***J. agric. Res., 1934, 49 : 283-313, bibl. 32.*

Studies were conducted on three problems, namely resistance in rosaceous plants, the effects of partially controlled environment on resistance in apple shoots, and the relation of certain internal host conditions to resistance. Both plants in pots and orchard trees were used as material. Wide differences in resistance were found among 31 rosaceous species of the following genera:—*Amelanchier*, *Aronia*, *Cotoneaster*, *Crataegus*, *Malus*, *Pyrus* and *Sorbus*. Differences were more marked between species of *Crataegus* than between the different genera. Differences between 25 apple varieties both under greenhouse and field conditions were considerable. Increased resistance accompanied increased age in apple shoots. Notes were made on the effect of soil nutrients, temperature and moisture, and of atmospheric temperature in the growth period prior to inoculation on resistance. Attempts to isolate the organism from different regions of blighted shoots showed that it was commonly present in all tissues towards the apical ends of the shoots from the cork layers and in the xylem and pith at a good distance towards the basal ends of the shoot from the cork layers. It was not found in the cortex, phloem or cambium of the basal ends. Observations indicate that once the fireblight lesions are corked off, the cork layers and the xylem commonly serve as relatively effective barriers against further invasion of the cortical, phloem and cambial tissues.

565. BERKELEY, G. H., AND LAUDER-TOMSON, I.

634.75-2.4

**Root rots of strawberry in Britain. The "black lesion" type of strawberry root rot.***J. Pomol., 1934, 12 : 222-46, bibl. 18.*

No complaint can be made by the poor strawberry as to lack of stimulus in the form of pests and murrains and in this article an account is given of investigations extending over some 13 months in England and Scotland on the fungi responsible for part at least of its worries. The senior author, aided by previous experience in north America,\* had little difficulty in tracking down the "black lesion" type of root rot in southern England. The data given here refer to this type only and to its incidence in the south of England. The authors differentiate

\* See The "degeneration" of the strawberry (part III), being *Tech. Comm. 5 of the Imperial Bureau of Fruit Production, 1934.*

between it and the "red core" type which is to be found in Lanarkshire and is widely distributed in Europe and America. A large number of inoculations were made from diseased roots and particular fungi were isolated by the flask, the direct sterilization, and the agar immersion methods, which are described. Reinoculation showed that 5 fungi at least are capable of parasitizing strawberry roots. These are *Coniothyrium Fuckelii*, *Hainesia Lythri*, *Cylindrocarpon radicicola*, *Fusarium orthoceras* and *Pachybasium candidum*. A healthy virus- and insect-free Royal Sovereign clone was used in all inoculation tests. The symptoms, which are very similar for all the above, comprise dwarfing and stunting of leaves and petioles and browning and drying of lower leaves, resulting in a flat plant. Badly attacked plants wilt and die. Roots of affected plants show lack of fibre, black lesions and dead roots. The first symptoms in spring appear on the roots formed the previous autumn and the attack passes from these to the current season's roots. There are indications that the host reacts to the attack by laying down cork cells in affected areas. What was apparently the progress of the disease in the field is described in two plantations at East Malling. It is suggested that the root rots described here play a major rôle in the "degeneration" of the strawberry, their action amounting to an almost constant root pruning. Control measures suggested are selection of runner plants free from "black roots" and crop rotation.

566. BLODGETT, F. M., AND MADER, E. O. 632.952.21  
**A method of recording the distribution of copper dusts or sprays on leaves.**

*Phytopathology*, 1934, 24 : 418-22.

A method is described whereby permanent prints may be made from sprayed leaves using paper moistened with an acidified potassium ferrocyanide solution. These show the distribution of the spray or dust on the leaf.

567. YOUNG, P. A. 632.951.8 : 634.11  
**Fungi and bacteria as indicators of the effects of petroleum oils on apple leaves.**

*Phytopathology*, 1934, 24 : 266-75, bibl. 13.

Fourteen species of fungi and bacteria were inoculated separately on to agar and covered with 22 petroleum oils in nearly 800 cultures and the behaviour of each organism was recorded. Records were also taken of the tolerance of the same oils by growing apple leaves. The details of a test are given whereby the toxicity of any such oil to apple leaves can be determined by inoculating *Rhizopus nigricans* on to agar and subsequently submitting it to different treatments and noting its growth.

568. MACDaniELS, L. H., AND BURRELL, A. B. 634.11-2.952  
**The effect of sulphur fungicides, applied during the bloom, on the set of apple fruits.**

*Phytopathology*, 1934, 24 : 144-50, bibl. 2

These observations made on Northern Spy and McIntosh trees supplement and on the whole confirm those made in a previous publication by the first author. Sulphur applied as dust or lime-sulphur spray either before pollination or shortly afterwards reduced the set of fruit. There are some indications that the spray reduced the set more than the dust. The authors note that the varieties used being self-sterile often fail to set owing to lack of pollination, and they suggest that the use of such varieties as Wealthy and Baldwin which usually set when they bloom might have given different results. In many orchards in many seasons trees could be dusted during bloom without serious reduction of crop, but in seasons unfavourable for pollination spraying or dusting at the time of flowering may seriously affect the crop return.

569. PENTZER, W. T. 632.951.23 : 634.11  
**Removal of lead and arsenic spray residues from New York apples.**

*Bull. Cornell. agric. Exp. Sta.*, 604, 1934, pp. 27, bibl. 5.

Fruit grown under western New York conditions and receiving the normal heavy spray schedules for those districts was successfully cleaned with 1% HCl (about 3 galls. to 100 galls. water) using

various types of equipment. Summing up the writer suggests that the following points are particularly important. (1) Wash at time of harvest, when there is no waxiness and bruising is more difficult to bring about than after storage. (2) Use from 2 to 3 gallons of rinse water per bushel of fruit washed. (3) Change and clean out the acid and rinse tanks after treating every 1,000 bushels of fruit, if acid tank is of 100 gallons capacity, and after 2,000 bushels, if of 200 gallons capacity. (4) Do not admit any rotten apples.

570. HOUGH, W. S. 632.78 : 634.11  
**Colorado and Virginia strains of codling moth in relation to their ability to enter sprayed and unsprayed apples.**  
*J. agric. Res.*, 1934, 48 : 533-53, bibl. 13.

It was found that the control of codling moth was much more difficult in Colorado than in Virginia. The writer found that Colorado larvae reared under Virginia conditions since 1928 consistently showed a distinct superiority over Virginia larvae in their ability to enter fruit sprayed not only with lead arsenate but also with such sprays as cryolite, barium fluosilicate, rotenone, cuprous cyanide and nicotine. The crosses made between the two types of larvae showed intermediate capacity for entering fruit. Resistance of eggs was also found to differ. The most essential difference of the strains\* was demonstrated in the partially developed embryo, and the newly hatched larvae, but disappeared to a certain extent in the full-fed larvae. The investigations established clearly the existence of different strains of codling moth, in which the young larvae vary greatly in vigour [and hence in danger to fruit.—ED.].

571. WIESMANN, R. 632.77 : 634.23  
**Untersuchungen über die Lebensgeschichte und Bekämpfung der Kirschfliege, *Rhagoletis Cerasi* L. II. Mitteilung. (Life history and control of the cherry fruit fly. 2nd Communication.)** [French summary.]  
 Reprint *Landw. Jb. Schweiz*, 1934, pp. 281-338, bibl. 28.

The author's first communication (*Ibidem*, 1933, pp. 711-60, *H.A.*, 1934, 4 : 1 : 75), was concerned mainly with the morphology and ecology of the pest, whereas the present article deals chiefly with control measures. Notes are given on the period of flight of the insects, this lasting for 62 days in 1933. Bait generally found extremely attractive to insects such as honey, cherry leaf extract, butyl alcohol etc. was not found so efficacious in the case of this fly as raw sugar. Notes are given on the insect's method of food absorption. Poison spraying in the field was not very successful owing to the removal of the spray by rain, and even after 5 applications the damage was only reduced a little less than 50%. Attempts to poison the newly emerged flies also failed in the field for the same reason, though the method had given great promise in the laboratory. Poisonous gas on the other hand such as naphthalene and paradichlorbenzene were quite successful. In one experiment spreading on the ground 20 gms. of the latter per square metre first at the time of emergence of flies and secondly 14 days later was extremely successful, hardly any grubs being found in the cherries from the test trees while more than 50% of the cherries from the control trees were contaminated. Different substances were tried against the pupae, lysol, crude pyridine and various soluble carbolineums (5 litres at 8% per square metre) proving particularly effective. For combating the fly in its larval state crude naphthalene at 250 gms. per square metre strewed with fairly late varieties at the beginning of picking and with late varieties 8 days before picking beneath the trees gave considerable success.

572. WIESMANN, R. 634.23 : 632.77 : 632.96  
**Ein Parasit der Kirschfliege (*Rhagoletis Cerasi* L.). (A parasite of the cherry fruit fly.)**  
*Mitt. schweiz. ent. Ges.*, 1933, 15 : 553-7, bibl. 5.

An account and description of an ichneumon parasite of the cherry fruit fly. It is identified as a *Phygadeuon*. Further investigations on its life history are apparently now in progress.

\* Virginia raised on arsenate sprayed fruit and Virginia raised on non-sprayed fruit and Colorado ditto and ditto.

573. LUNDBLAD, O. 632.78 : 634.711  
 Hallonmalen som skadedjur i sverige. (*Incurvaria rubiella* Bjerk as a pest in Sweden.) [German summary.]

*Medd. Växtskyddanst. Stockh.*, 4, 1934, pp. 13, bibl. 35.

This raspberry pest has not yet become very dangerous in Sweden, though it has tended to become more troublesome lately. The life history is described, the damage being done by the caterpillars to the buds. 10% carbolineum and grease banding are recommended as adequate control measures.

574. BOYCE, A. M. 632.77 : 634.51  
 Control of the walnut husk fly, *Rhagoletis completa* Cress.  
*J. econ. Ent.*, 1934, 26 : 819-25, being Paper 277, *Univ. Calif. grad. School trop. Agric. Citrus Exp. Sta.*

Laboratory and field tests show that synthetic cryolite and barium fluosilicate were the best of the materials tested for the control of this fly. The materials tested included certain arsenical, fluorine, nicotine and copper compounds. [From author's summary.]

575. BOYCE, A. M. 632.77 : 634.51  
 Influence of host resistance and temperature during dormancy upon seasonal history of the walnut husk fly, *Rhagoletis completa* Cress.  
*J. econ. Ent.*, 1933, 26 : 813-9, being Paper 278, *Univ. Calif. grad. School trop. Agric. Citrus Exp. Sta.*

A five year biological study shows that host resistance is directly related to hardness of the walnut husk at the time of oviposition activity of the fly. Accumulated temperature appears to be of primary importance in influencing the termination of dormancy and so seasonal adult emergence. The seasonal history of the insect in California is graphically shown for the period 1928-32. [From author's summary.]

576. LINDBLOM, A. 634.22-2.654.2  
 Plommongallkvalstret och dess bekämpande. (The plum gall mite (*Eriophyes similis* Nal.) and its control. [German summary.]  
*Medd. Växtskyddanst. Stockh.*, 6, 1934, pp. 18, bibl. 42.

Details taken from official records between 1911-32 show that the mite exists practically throughout the plum growing area in Sweden. The author reviews its incidence in other parts of Europe, and describes its life history, its effects on different parts of the tree, on different host plants and its economic importance. Notes are given on varietal susceptibility and on control tests with various sprays, the results of these being tabulated. Spraying was done in the dormant season with various mineral and tar oils and with Acme lime sulphur, a very fair measure of success being achieved in all cases, Texide, an emulsifying mineral oil, being the least successful.

577. MILLER, N. C. E. 632.951.1  
 Control of insect pests in stored derris.  
*Malay. agric. J.*, 1934, 22 : 367-8.

Derris root in store is liable to attack by several species of beetle. Infection is not always apparent and samples of roots should periodically be split and examined. The appearance of frass among the derris shows that infection is serious. Preventive measures consist in providing a beetle proof store, which is a counsel of perfection, the removal of all odd pieces of root before re-stocking a cleared store, the elimination of all roots having a diameter of more than  $\frac{1}{2}$  inch. These roots have little toxic value. Reducing the roots to powder completely eliminates the insects but requires a special type of mill. A local firm in Malaya has devised a method which has given satisfactory results. The roots, which must be rapidly dried, are cut into 2 inch lengths and packed in plywood tea chests  $19 \times 19 \times 24$  inches. The chests hold 100 lb. If infestation has already taken place and the roots are still usable, the beetle may be destroyed by

one of the following methods :—Removing the roots from store and exposing them, preferably on a cement or iron flooring, to hot sunshine for 5 hours. This method being inexpensive it is therefore recommended as an occasional precautionary measure. Fumigation for 72 hours in an airtight chamber with carbon bisulphide, preferably applied by spraying on cloth or sacking laid on top of the pile. The dosage is 2-3 lb. per 1,000 cu. ft. Subjecting infested root to heat without scorching for 3 days using, for example, the smoke house on a rubber plantation.

578. SILVESTRI, F. 634.63-2.7  
*Rassegna degli insetti dell' olivo del bacino del Mediterraneo. (Survey of olive insects in the Mediterranean basin.)*  
 Reprint *Atti XI Congress. Int. Olivicolt. Lisbon.* Publishers Fed. Ital. consorz. agrar., Rome, 1934.

The author first deals in considerable detail with the olive's most notorious enemy the olive fly, *Dacus oleae*, paying particular attention to its known parasites and their possible use as counter parasites. The use of any one of these cannot as yet be confidently recommended, at any rate in Italy, but the author considers that further investigations will not be so expensive and are likely to prove equally if not more efficacious than similar work on artificial control methods. The latter are discussed and criticized and suggestions are made for their most profitable use. Six other Diptera pests are also dealt with. Lepidoptera are then considered, particular attention being paid to *Prays oleellus*. Hymenoptera include among others the ant *Cremastogaster scutellaris*, which is partly harmful, partly beneficial. The Coleoptera contain a fair number of olive pests of less or greater importance, among the latter being *Cionus fraxini* and *Rhynchites ruber*. A large number of scale insects can be numbered among the Hemiptera-Homoptera pests of the olive and these are also described here. Among the Thysanoptera *Liothrips oleae* may cause serious damage. A few other pests are also noted. Appendix I contains observations made in Sicily and Southern Italy on Scolytidae harmful to the olive, while Appendix II consists of a special note on the biology and parasites of *Liothrips oleae*, mentioned above.

579. BUA, G. 634.63-2.77  
*I fattori meteorologici e la mosca dell' olivo. (Meteorological factors and the olive fly.)*  
 Reprint *Met. prat. Perugia*, vol. 15, no. 3, pp. 12, bibl. 6.

The author's observations over 3 years in the commune of Pisciotta, Southern Italy, lead him to the following conclusions :—(1) The factor which chiefly decides the seriousness of infestation is rain. The greater the number of days on which rain falls, the worse the infestation. (2) Temperatures of 24° C. (75° F.) and over in July retard the development of the olive, and the fly larvae being consequently unable to get sufficient food die. (3) Parasitic activity at the beginning of the infestation is of considerable importance in reducing the first 2 or 3 generations of the fly. (4) Other things being equal the strength of the attack depends largely on the size of the initial infestation. (5) In Southern Italy when the temperature rarely falls below about 9.3° C. (48.7° F.) there is no break in the fly's incidence and its effects are apt to increase by leaps and bounds.

580. TROUCHAUD, F. 632.951.1  
*Le pyrètre dans le Midi de la France. [Pyrethrum growing in the south of France]*:  
*Rev. Vitic. Paris*, 1934, 81 : 248-50.

The chief centre of pyrethrum growing is the plain known as " le Plan de Dieu " in the north of Vaucluse. The soil is stony, about 60% being pebble, the remainder a reddish clay with pH 7 to 7.5, although it contains little lime. The assimilable nitrogen and potash is weak, 1.5% and 1%, and the phosphoric acid very weak, 0.1%. Sowing, provided the plants will stand the southern winter, is best done in autumn, spring sown plants requiring expensive attention such as shading, evening watering, etc. The plants are transplanted from the nursery

in April and bear a half crop a year later. They remain in full bearing for 5 years and are then discarded. If mechanical cultivation is to be used the planting distance is 70 cm. in each direction. Should the contour allow only of mechanical cultivation along the slope, the spacing can be 35 cm. by 70 cm., and if hand hoeing only is possible, 35 cm. each way is enough.

581. VANWIJNGAERDEN, G. 632.654.2 : 632.96 : 634.8  
 Notes sur le *Stethorus punctillum*, ennemi naturel de l'araignée rouge. (**Notes on *S. punctillum*, an enemy of red spider.**)

Reprint *Agricultura, Louvain*, Nov. 1934, pp. 7, bibl. 8.

The author has been studying a parasite of the red spider on vines grown under glass. He finds that this parasite, which belongs to the *Coccinellidae*, is parasitic both in its larval and perfect state on red spider. He here details most of its life history, the only part remaining to complete the picture being the egg stage and the hatching out of the larva. On this he hopes to report shortly after further observations. It would appear at least possible that the insect may afford effective counter parasitic control of red spider in glasshouses, once effective methods of raising it have been devised.

582. FLEMING, W. E., AND BAKER, F. E. 632.76 : 632.951  
**Testing contact insecticides on the Japanese beetle and results with some sodium and potassium soaps.**  
*J. agric. Res.*, 1934, **49** : 29-38, bibl. 4.  
 and,  
 FLEMING, W. E., AND BAKER, F. E. 632.76 : 632.951  
**The effectiveness of stomach poison insecticides on the Japanese beetle.**  
*Ibidem*, 1934, **49** : 39-44, bibl. 4.

The authors conclude that the best method of testing the effectiveness of contact sprays is to completely submerge the beetles for 2 minutes in the material to be tested and then keep them at a temperature of 80° F. and a relative humidity of 96% for 24 hours. Sodium soaps were found more effective than potassium soaps and soaps containing excess alkali were more effective than neutral soaps or those containing free oleic acid. In the second paper the results are given of tests made with various stomach poisons taking acid lead arsenate at 8 lb. per 100 gallons as the standard for comparison. Both sets of experiments referred to in these articles were carried out under controlled conditions in the laboratory.

583. FLEMING, W. E., AND BAKER, F. E. 632.76 : 547.652:1  
**The use of naphthalene against the Japanese beetle.**  
*Tech. Bull. U.S. Dept. Agric.*, **427**, 1934, pp. 28, bibl. 55.

The difficulty in using naphthalene against *Popillia japonica* is that in most cases the plants to be protected are just as susceptible to naphthalene vapour as the pest. These trials indicate that applied to the soil it effectively destroys the immature stages of the beetle. It has little effect on the adult beetle. It cannot, moreover, safely be used in insecticidal concentrations above the roots of growing plants. Its use is limited to conditions where the soil can be treated before the plants are in the ground.

584. METZGER, F. W. 632.76 : 632.949  
**Traps for the Japanese beetle and how to use them.**  
*Misc. Publ. U.S. Dept. Agric.*, **201**, 1934, pp. 11.

A practical illustrated account of 2 satisfactory types of trap baited with solid, or better, liquid bait used at the rate of 1 part eugenol to 10 parts geraniol. Where liquid bait is used the attractants are vaporized by means of a wick, when solid bait is used the mixture will consist of geraniol, eugenol, bran, water, molasses and glycerine. This will probably have to be replaced fortnightly as compared with a properly prepared liquid bait, which should last a whole season. Information on the subject can be got from the Japanese beetle laboratory of the Bureau of Entomology, Moorestown, New Jersey.

585. FLEMING, W. E., AND OTHERS. 632.76  
Protection of orchard and shade trees and ornamental shrubs from injury by  
the Japanese beetle.  
*Circ. U.S. Dep. Agric.*, 317, 1934, pp. 7.

A brief account is given of the distribution of the beetle, of the nature of the injury done, of the fruits and ornamental plants attacked and of general methods of protection. Special control measures for the protection of apples, peaches, plums, cherries, grapes, small fruits and ornaments are briefly touched on.

The following also are noted :—

WILSON, E. E. A bacterial canker of pear trees new to California. *Phytopathology*, 1934, 24 : 534-7, bibl. 7. [The organism is as yet unidentified.]  
WILSON, E. E. Variability of *Pseudomonas Cerasi* in physical characteristics of growth on solid media. *Phytopathology*, 1934, 24 : 548-50, bibl. 7.  
PLAKIDAS, A. G. The mode of infection of *Diplocarpon earlianum* and *Mycosphaerella Fragariae*. [Strawberry leaf spot and scorch.] *Phytopathology*, 1934, 24 : 620-34, bibl. 8.  
KOCH, L. W. Studies on the overwintering of certain fungi parasitic and saprophytic on fruit trees. *Canad. J. Res.*, 1934, 11 : 190-206, bibl. 19.  
KOCH, L. W. Investigations on black knot of plums and cherries II. The occurrence and significance of certain fungi found in association with *Dibotryon morbosum* (Sch.) T and S. *Sci. Agric.*, 1934, 15 : 80-95, bibl. 18.  
FOLSOM, D. Apple spraying and dusting experiments 1928 to 1932 in relation to scab, yield, and tree growth. *Bull. Me. agric. Exp. Sta.*, 368, 1933, pp. 417-501, bibl. 7 pages.  
HOSKINS, W. M. The penetration of insecticidal oils into porous solids. *Hilgardia*, 1933, 8 : 2 : 49-82, bibl. 25.  
CRAFTS, A. S. Sulfuric acid as a penetrating agent in arsenical sprays for weed control. *Hilgardia*, 1933, 8 : 4 : 125-47, bibl. 14.  
UNDERHILL, G. W. The green stinkbug (*Acrosternum hilaris* Say.). *Bull. Virginia agric. Exp. Sta.*, 294, pp. 26, bibl. 11.  
AHLBERG, O. Skadedjur i Sverige. (Pests in Sweden, 1928-1932.) *Medd. Växtskyddanst, Stockh.*, 7, 1934, pp. 49.  
PESCOTT, R. T. M. Codling moth control. Results of experiments 1933-4. *J. Dept. Agric. Vict.*, 1934, 32 : 503-16.

#### VEGETABLE GROWING.\*

586 BEWLEY, W. F. 632.1/8 : 631.544  
Health and disease in plants. (Masters Memorial Lectures, 1934.)  
*J. roy. hort. Soc.*, 1934, 59 : 386-96, bibl. 9.

The author discusses the progress made in safeguarding the health of plants, especially glasshouse crops. The problem is considered from different aspects. *Health and susceptibility of the host*.—Generally speaking, if the form of the plant is abnormal and unbalanced, it becomes susceptible to attack. Its health, moreover, is affected by variety and strain in relation to environmental conditions. Again it is affected by the soil. The physical condition of the soil is particularly important, free circulation of air being essential. The chemical aspect fluctuates between unbalanced food values and the presence of compounds injurious to plants. Thus potash deficiency, especially in dull seasons, results in unhealthy tomato plants. Poisoning by salts such as chlorates may cause ill-health, while poisoning may also occur as the result of

\* See also 528, 675, 676.

heavily manuring soils for a number of years and leaving them close, cold and wet for long periods, the poisons then being apparently of a nitrogenous nature. *The vigour of the parasite.*—The vigour depends largely on its previous history and organisms normally saprophytic will at first often be only weakly parasitic when transferred to living material. After feeding on the living host for some time, however, the strength of their parasitism increases, e.g. the *Botrytis* stem rot of the tomato. Each fungus has its own range of temperature at which it is particularly virulent. High atmospheric humidity favours the spread of many leaf and fruit diseases through spore germination, while a moderately dry wind favours the dispersal of the spores. *Source of infection.*—Water from ponds, slow streams and shallow wells is often contaminated with disease-producing organisms. All weeds, plant refuse, etc., are a constant source of infection. *Prevention of disease.*—Plants grown in a balanced condition so that growth proceeds unchecked and uniformly are usually resistant to all but such virulent diseases as the footrot caused by *Phytophthora* and *Rhizoctonia*, wilt caused by *Verticillium* and *Fusarium*, and the different viruses. Most other diseases only follow injury caused by unfavourable conditions. "Soil sickness" in glasshouses has in the past been eliminated by soil sterilization, but experiments during the last 10 years at Cheshunt suggest that the condition is associated to some extent with the disappearance of coarse "fibre" in the form of grass and other roots. Further experiments in commercial nurseries have now proved that the condition can be very largely corrected by applying sufficient opening material in the form of peat, spent hops or clean straw. The last is preferred as being cheapest and most efficient. The method of application is important and is described here. Briefly, the straw must not be dug in in haphazard fashion, but must be placed in layers as nearly vertical as possible. The rate of application is three tons an acre to the top 10 inches and the same amount to the subsoil. Methods of chemical and heat sterilization are discussed. *Soil temperatures.*—These are too low in this country during winter and early spring for satisfactory root growth and root diseases may result. A system of soil warming by electric cables or hot water pipes will by stimulating root growth prevent many such diseases. These systems are still in their infancy but offer great promise for the future. *Fungicides.*—Attention is drawn to the increased efficiency given to spraying by the use of certain new products and of new wetting agents, especially the sulphonated oil type of wetting agent which is in powder form. Emulsified petroleums are now coming into extensive use as insecticides, and it is found that mixed with compounds of definite fungicidal value they form a spray which persists on the foliage for some time. This comparatively new development may have a far-reaching effect. Other improvements among fungicides include a dispersed form of salicylanide and copper and sulphur in colloidal forms. Finally the ideal method of disease prevention lies in the use of resistant varieties.

587.

BECKER, J.

631.8 : 635.1/7

Ergebnisse und Fortschritte in der Düngung der gärtnerischen Kulturpflanzen.  
(*Progress in the investigation of manurial requirements of horticultural plants.*)

*Biederm. Zbl.*, 1933, Neue Folge 4ter Band, Jahrg. 63, pp. 161-79, bibl. 39.

This article is a review of experimental work on the manuring of vegetables and it contains short notes on the manuring of fruit trees and ornamentals. In most cases the results of individual experiments are quoted, particular attention being paid to the amount of nutrient substances removed from the soil by particular crops and to the necessity for choosing the appropriate dates at which to apply fertilizers. In a short preliminary section pH preferences are discussed for the common kitchen garden crops, for ornamentals and for small fruits. Top fruits appear to tolerate a fairly wide range of pH values, the water-table and water conditions generally being of greater importance. Among vegetables, the manuring of which is discussed, are various types of cabbage, beetroot, spinach, lettuce, endive, carrots, celery, onions, leeks, cucumbers, tomatoes, beans, asparagus. A short note on manuring of fruit is devoted mainly to the possibilities raised by the Heda fertilizer lance [*H.A.*, 1933, 3 : 3 : 301 and 1934, 4 : 2 : 189].

588. MOEN, O. 635.1/7-1.84  
 Forsøk med ulike utstrøningstider. . . . . (Trial of varying the times of applying soluble nitrogenous fertilizers to vegetables.) [English summary.]  
 Reprint from *Meld. Norg. LandbrHøisk*, 1934, pp. 6.  
 Experiments made at the Vegetable Experiment Station of the Agricultural College of Norway (mean rainfall 762 mm.) on an argillaceous soil indicated that there was little difference in cabbage crop resulting from application of fertilizer before sowing and application 1/3 nitrogen before sowing and the rest in 3 equal doses:—just after germination, shortly after thinning, and 14 days after thinning. Parsley and parsnip unlike cabbage showed no appreciable benefit from nitrogen fertilizer applied in the year of growing.

589. MOEN, O. 635.1/7-1.588.1  
 Dyrkningsprøver og forsøk med endel grønnsakvekster. . . . . (Experiments with vegetables and other crops on outdoor soils electrically heated.) [English summary.]  
 Reprint from *Meld. Norg. LandbrHøisk*, 1934, pp. 14.  
 Experiments show that best results are obtained when, in addition to heating the soil, glass is put over the plants. In a soil heated 4° to 6° C. all vegetables tried made good use of the heat during germination and early growth, getting a start of 5 to 12 days over the controls. Continuing the heat throughout the growing life did not in general increase this early gained lead except in the case of such heat demanding vegetables as cucumbers, cantaloups, sweet corn, etc.

590. JOHANSSON, E. 631.829 : 631.544 : 635.61  
 Kolsyrebestämmningar i drivbänkar vid Alnarp 1933. (CO<sub>2</sub> experiments with melons in frames.) [English summary.]  
*Medd. Alnarp Trädg. Försöksverks*, 1934, 35 : 1-12, bibl. 6.  
 Melons were grown in frames heated as follows:—(1) hot water circulated in copper pipes, straw added, (2) ditto, without straw, (3) steam (the sigma system), straw added, (4) ditto, without straw, (5) bedded on stable manure, straw and leaves, (6) bedded on straw. The stable manure was 50 cm. (20 inches) deep. The soil temperatures, CO<sub>2</sub> content and crop yields were noted and are tabulated here. The manure bed and the straw bed gave the highest yields. The plants in the artificially heated beds, where cut straw had been introduced and incorporated with the soil, were rather earlier and gave a little larger crop than those where no straw had been used. The nutritive conditions were good in all cases, so that the earlier development and larger crop would appear to have been due to increased CO<sub>2</sub> production. [From author's summary.]

591. JOHANSSON, E. 631.829 : 631.544  
 Kolsyrehalt i växthusluft. (CO<sub>2</sub> content of air in glasshouses.) [English summary.]  
*Medd. Alnarp Trädg. Försöksverks*, 1934, 35 : 13-20, bibl. 4.  
 The result of two experiments are here recorded. In the first the CO<sub>2</sub> content of two glasshouses was determined over a period of about a month, October to November, one of the houses being provided with a 25 cm. (10 inches) bed of manure and straw heaped on a table in the centre, the other not having this. The CO<sub>2</sub> content in the first house was much the higher and remained so for several months. The temperature, recorded only in the initial stages according to the figures given, was also higher. In a second experiment it was again found possible greatly to increase the CO<sub>2</sub> content of the air in a glasshouse by introducing a bed of cut straw and manure 25 cm. thick. Its effect after introduction on March 5th was considerable until March 21st, after which it quickly waned. No attempts were made in these experiments to estimate the effect of increased CO<sub>2</sub> on plant growth.

592. STEWART, W. D., AND ARTHUR, J. M. 581.192 : 537.531 : 635.1/7  
**Some effects of radiation from a quartz mercury vapor lamp upon the mineral composition of plants.**

*Contr. Boyce Thompson Inst., 1934, 6 : 225-45, bibl. 19.*

Tomato, tobacco, datura, lettuce, salvia and cabbage plants were irradiated for varying periods at 15 inches from a quartz mercury lamp. Effect was much greater when the plants were growing under conditions of poor light intensity. The nutrition of the plants also affected the results of irradiation: thus plants grown in sand having a different mineral composition to that of the soil were much more sensitive to injury by irradiation than plants on soil and displayed increase in ash and altered calcium phosphorus level even when grown under high light intensity. Irradiation had no effect on Mg and Mn content. Cabbage, which is known to be lacking in antirachitic properties even when irradiated, failed to show any increase in ash, Ca or P after treatment. Plants sprayed with irradiated ergosterol in olive oil showed increased ash and Ca content. It is believed that the ultra violet radiation which effects an increase in ash and in Ca and P of both of treated plants exerts its influence indirectly by activation of the ergosterol present in the plant tissues. [From authors' summary.]

593. ANON. 631.544.3 : 631.588.1 : 635.52  
**Soil heating by buried electric cables.**

*Rur. Electrif., 1934, 10 : 24..*

A successful attempt was made to force English grown glasshouse lettuce into marketable condition during the winter months by means of electrical soil heating. The heated bed contained 150 ft. (700 watts) of soil heating cable spaced to give a loading of 10 watts per sq. ft. To take advantage of the special price rates the switches could only be operated between 10 p.m. and 8 a.m. and noon and 3 p.m. A soil temperature of 55° F. - 60° F., measured 4 in. down in the soil, was maintained without difficulty. A minimum air temperature of 40° F. was also maintained by fire heat from January. Lettuce seeds (variety not stated) were sown on November 11th. The first lettuce was cut on February 20th and the bed of 170 lettuces was finished by March 8th. The lettuce in the unheated control bed on the opposite side of the house was not ready until a month later. The electrical consumption for soil heating from November 9th to March 8th was 685 units, an average of 8.3 hours per day.

594. PLATENIUS, H. 635.13 + 664.84.13  
**Physiological and chemical changes in carrots during growth and storage.**

*Mem. Cornell agric. Exp. Sta. 161, 1934, pp. 18, bibl. 7.*

Chemical data obtained from two trials described here show that young carrots do not have a higher quality than old ones, but that sweetness and colour intensity increase with age. In fact results were obtained suggesting that the younger roots have a lower nutritional value than the older ones. Observations of the chemical changes occurring during storage leads to the conclusion that carrots stored without their stalks at 32° F. to 40° F. under conditions of high humidity will retain a high degree of eating quality and food value for at least 5 months. The loss of water from the roots during the first two weeks of storage was large enough to make the storage of bunched carrots inadvisable even for a short period.

595. DU PLESSIS, S. J. 635.25-2.48  
**Pink root and bulb rot of onions.**

*Sci. Bull. Dep. Agric. S. Afr., 124, 1933, pp. 30, bibl. 20.*

Infection experiments in pots and water cultures have shown that *Fusarium Cepae* Hanz. emend. Link & Bailey, causes pink root and bulb rot, while *Phoma terrestris* Hansen is responsible only for the condition known as pink root. *F. Cepae* forms the subject of the present enquiry. Optimal growth takes place at approximately 26° C. The infection is found to decrease with increased irrigation. Effective disinfection is achieved by immersing the seed for 15 minutes

in a 0·1% mercuric chloride solution. An effective method of disinfecting seedbeds is to burn straw or shrubs on them for 45 minutes. It is suggested that on infected lands a 4 year rotation would go a long way towards eliminating the trouble.

596. JONES, H. A., AND OTHERS.

632.73 : 635.25

**Thrips resistance in the onion.**

*Hilgardia*, 1934, 8 : 7 : 215-32, bibl. 45.

The authors consider first the more important work dealing with resistance to sucking insects, which may be physical, chemical or physiological. Among the insects considered are various leaf hoppers, aphids and mites. The exact nature of the resistance generally remains undetermined. The nature of resistance to thrips in onions is considered with special reference to the White Persian variety. The following factors would appear to restrict the thrips population on this variety:—the shape of the leaves, the angle of divergence of the two innermost leaves and the distance apart of the leaf blades on the sheath column. As regards resistance to injure the factors concerned are not so clear, though leaf colour and leaf thickness are probably concerned. The White Persian is not in itself a desirable commercial variety, since it has a tendency to split badly and does not keep well. At present F<sub>2</sub> and first back-cross generations of crosses with commercial varieties are being grown in the greenhouse and in the field. The first crosses were made by intermingling under muslin cages. Seed was then sown in the cold frame and from the resulting plants the F<sub>1</sub> plants with a darker foliage could be easily selected. Some of these were selfed, some were back crossed to commercial types. The work is still in progress.

597. McCALLUM, R. D.

635.262

**Growing and handling garlic in California.**

*Circ. Calif. agric. Ext. Serv.*, 84, 1934, pp. 16.

Nearly 3,000 tons of garlic were imported into the U.S. in 1932, this being the highest total reached, at least since 1925. Supplies came chiefly from Spain, Chile, Mexico and Italy in descending order of amounts. Full details are given for cultivating the plant. The types grown in California are the Early (or White or Mexican) and the Late (or Pink or Italian). Yields of Early range from 5,000 to 9,000 lb. per acre, of Late from 4,000 to 7,500 lb. The standard grades of the U.S. department of agriculture are detailed. A few notes are given on pests and diseases.

598. TOWNSEND, G. R.

632.48 : 635.52

**Bottom rot of lettuce.**

*Mem. Cornell agric. Exp. Sta.*, 158, 1934, pp. 46, bibl. 35.

No varieties showing resistance or immunity to *Rhizoctonia Solani* Kühn are known. The disease was found to be most severe when the mean daily temperature was above 67° F. and daily minimum above 50° F. Humid weather favours the disease, but is not so essential as high temperature. Acidity and nitrate accumulation do not affect it. Crop rotations, the use of green manures and good cultivation practice help to reduce losses from this disease. The copper and sulphur fungicides tried, e.g. bordeaux, copper lime, colloidal sulphur etc., do not control it. Mercury compounds are generally an effective control but are frequently injurious to the crop. Effective and satisfactory control was, however, obtained by a single application of 20 to 25 lb. per acre of nearly mature plants of an ethyl mercury phosphate dust.

599. MUSBACH, F. L.

635.656-1.8

**Method of fertilizer application for canning peas.**

*J. Amer. Soc. Agron.*, 1934, 26 : 70-4.

On average silt loam soils in Wisconsin a three year test showed the advantage of drilling with the seed 250 to 300 lb. 20% superphosphate per acre and about the same amount of complete fertilizer relatively low in nitrogen, e.g. 2-12-6 or 2-16-8. The reduction in stand was more than compensated by the increased vigour of the surviving plants.

600. LAMBERT, E. B. 635.8 : 581.084.2

**Size and arrangement of plots for yield tests with cultivated mushrooms.**

*J. agric. Res.*, 1934, 48 : 971-80, bibl. 5.

In commercial practice in the U.S.A., mushrooms are generally grown on shelf beds in windowless sheds or houses. An average house is about 60 ft. long and contains 2 tiers or 5 or 6 shelf beds in which individual beds are 2 ft. apart. The beds 5 or 6 ft. wide run the length of the house, being generally divided by upright supports at 4 foot intervals into 4 ft. wide sections. Tests at the Arlington experiment farm indicate that small plots are preferable to beds as experimental units. Double sections containing 40 to 48 square feet of bed space seemed to be the most practical size of plot for experiments in commercial houses. In one experiment distinct advantage was derived by so arranging the plots on the beds as to make it possible to account for the excess variation between beds in analysing the data. A gain in precision was also apparent when test plots did not coincide with areas used as units for filling the beds. At least 5 or 6 replications appeared necessary.

The following also are noted :—

KOSTOFF, D., AND KENDALL, J. **Studies on polyploid plants. III. Cytogenetics of tetraploid tomatoes.** *Gartenbauwiss.*, 1934, 9 : 20-44, bibl. 30.

MCCOLLUM, J. P. **Vegetative and reproductive responses associated with fruit development in the cucumber.** *Mem. Cornell agric. Exp. Sta.*, 163, 1934, pp. 27, bibl. 22.

WILSON, A. L. **Relation of nitrate nitrogen to the carbohydrate and nitrogen content of onions.** *Mem. Cornell agric. Exp. Sta.*, 156, 1934, pp. 30, bibl. 22.

AHLBERG, O., AND PALMGARD, A. **Undersökning över cyanvärets. . . . (The use of cyanogas for the control of pests in greenhouses.)** *Medd. Växtskyddanst.*, Stockh., 8, 1934, pp. 18.

### FLOWER GROWING.

601. GIBSON, A. 632.6/7 : 635.9

**Insects of the flower garden and their control.**

*Bull. Dep. Agric. Can.*, 99, 1934, pp. 69.

This most useful, practical bulletin on Canadian insects should by its illustrations and descriptions enable the flower gardener to identify and control most of the common garden pests. Beneficial insects are also clearly described. Formulae are given for a number of standard insecticides of proved value and hints are added on the method and time of their application.

602. EMSWELLER, S. L., AND JONES, H. A. 635.939.516-2.452

**The inheritance of resistance to rust in the snapdragon.**

*Hilgardia*, 1934, 8 : 7 : 197-211, bibl. 7.

The rust (*Puccinia Antirrhini* D. & H.) was first observed by Blasdale on the Pacific Coast in 1896. It is now rampant in England. Cultural methods of prevention proving inadequate seed was got from resistant selections made at the Indiana experiment station and was grown in localities in California where the rust was particularly severe. Several resulting plants showed high resistance. They were open pollinated and seed was collected. In 1931 progenies of these were grown in various places in California when a very few plants were found to be entirely free from rust. A few of these individuals were removed to Davis where they were self pollinated and crossed with several varieties known to be susceptible. The results showed that resistance is controlled by a single dominant gene. Several highly resistant plants were used in crosses with known susceptible varieties and the results indicated the presence of modifying genes. This seems to be a logical explanation for the fact that immune plants were got from highly resistant parents, since segregation would tend to produce some types free from modifying genes. The original plants used only because of their resistance are undesirable,

but progress has so far been very encouraging in the attempt to transfer the resistant gene to good commercial varieties as soon as possible by the back-cross method. [From author's summary.] [Chittenden in a brief note in the *J. roy. hort. Soc.*, 1934, 59 : 5 : 450-1, recommends the complete destruction by fire of all *Antirrhinum* plants or parts of plants in early winter to ensure the death of any uredospores, by which alone apparently the disease is reproduced, and the sowing of fresh seed in the spring. All available evidence, indicates, he says, that infection is not carried on, in, or with the seed.—ED.]

## 603. HILL, H., AND OTHERS.

635.939.98-1.8

*Nutritional studies with chrysanthemums.**Sci. Agric.*, 1934, 15 : 110-23, bibl. 1.

Three varieties of chrysanthemum, Sir William Clark, Marie Adelaide and Mrs. F. C. Elford, were grown in sandstone in pots and received different nutritional treatments. A nitrogen-potassium ratio of 1 to 2 produced fine plants. A higher ratio gave definite foliage injuries which were increased by high phosphorus feeding. This last may also cause reduced flower bud formation and size of bloom. Deficient phosphorus and deficient potassium treatment gave foliage symptoms which might prove valuable in diagnosis. The colour of bloom depends to a marked extent on an adequate potassium supply both in total amount and in relation to the amount of nitrogen and phosphorus available. Ash analysis of the plant top revealed a negative correlation of the nitrogen-potassium ratio on the accumulation of potassium, calcium, magnesium and phosphorus, and antagonism between potassium and phosphorus. Foliage troubles and poor bloom colour were associated with low potassium in plant ash and high calcium, magnesium or phosphorus, brought about by widening the nitrogen-potassium ratio in the nutrient solution or by increasing the concentration of phosphorus. Microchemical and calorimetric tests of plant tissue showed that high nitrogen feeding led to the accumulation of high nitrate-nitrogen in the stems at the expense of the foliage. A narrow nitrogen-potassium ratio appears necessary for an efficient translocation of the former element. Antagonism between potassium and phosphorus was again shown. High potassium and high phosphorus feeding were reflected by a high test for these two elements in the plant tissue. Degree and character of response to nutritional treatments may be influenced by variety. A batch of plants grown in river sand and fed with nutrient solutions compared favourably with plants grown in soil on commercial lines. [From authors' summary.]

## 604. GRIFFITHS, D.

635.944

*Bulbs from seed.**Circ. U.S. Dep. Agric.*, 311, 1934, pp. 32.

A plea is uttered for propagation by seed of many bulbous plants. It is admitted that with highly bred tulips and daffodils the demands made by the consumer require an exactitude which can only be reached by clonal reproduction, but it is urged that the natural species of these bulbous plants can be advantageously reproduced by seed. Generally speaking any natural species of bulb unmodified by hybridity will reproduce the parent from seed. In daffodils and tulips only the natural species can be propagated in this way, but certain bulbous species, e.g. *Chionodoxa luciliae*, do not divide at the bulb and are always seminally propagated, while a large number of other species, in which uniformity of flower colour is not essential, lend themselves readily to propagation by seed. Even if, as in many cases, it takes 3 or 4 years to bring such seedlings to marketable size, it is commonly a much cheaper method than the vegetative one, by which the merchantable offset can be produced in half the time. The author shows how on a 3 foot bed 50 ft. long it will be possible to produce from seed 25,000 saleable seedling bulbs of, say, *Narcissus triandrus albus*, in 4 years as against a mere 8,400 bulbs by vegetative reproduction. Details are given on preparing and planting the seed bed, and particular cultural points are discussed with reference to most of the common bulbous plants, many of which appear in English gardens in the spring.

605. DENNY, F. E., AND MILLER, L. P. 635.944 : 547.313.2  
Hastening the germination of dormant gladiolus cormels with vapors of ethylene chlorhydrin.

*Contr. Boyce Thompson Inst.*, 6 : 31-8, bibl. 1.

Sprouting of cormels of 5 different varieties of gladiolus was hastened by the use of 3 to 5 cc. of 40 per cent. ethylene chlorhydrin per litre of air space within a closed container for from 3 to 5 days. The gain was largest in tests made a considerable time and not immediately after harvest. The amount of time gained varied also with the varieties. In Souvenir and Alice Tiplady about 60 to 90 days were gained in the time taken to reach a certain stage in germination, while in Remembrance gains of 100 to 180 days were achieved.

The following also are noted :—

HARRIS, M. R. A *Phytophthora* rot of snapdragons. *Phytopathology*, 1934, 24 : 412-7, bibl. 5.  
BURNETT, G. Stunt—a virosis of delphinium. *Phytopathology*, 1934, 24 : 467-81, bibl. 5.  
YOUNG, P. A. Stem canker of hollyhock caused by *Sclerotinia sclerotiorum*. *Phytopathology*, 1934, 24 : 538-43, bibl. 4.

#### CITRUS AND SUB-TROPICALS.

606. GANDHI, S. R. 634.3  
Cultivation of citrus fruits in India.  
*Calif. Citrogy.*, 1934, 19 : 303, 345, 358.

The chief citrus varieties cultivated commercially in India are Santara which is a type of Mandarin (*Citrus nobilis*), Malta and Mosambi Sweet oranges (*Citrus sinensis* Osbeck), a Mexican lime (*Citrus aurantifolia* Swingle) and the shaddock (*Citrus maxima*). The various climatic conditions of the orange growing districts of India and the effect of their differences on the fruit and its cultivation are briefly outlined. The Marsh grapefruit which has been recently introduced has withstood frost to a remarkable extent and has proved practically immune to a virulent type of limb gummosis which attacked other neighbouring citrus varieties. A botanical description (illustrated) is given of the oranges and shaddock already mentioned and of the four principal rootstocks, consisting of two lemons, a lime and a sour orange.

607. YEDIDYAH, S. 634.31  
Variation in the Jaffa orange. [Hebrew-English summary.]  
*Hort. Bull. Mikveh-Israel agric. School* 4, 1934, pp. 19.

The Jaffa orange is shown to possess a number of off types which are of frequent occurrence in Palestine groves. Fifteen are listed here. It is pointed out that one off type in particular, the Beledi, a round, seedy, native type, is often propagated either through carelessness or ignorance. As an instance of the value of bud selection the case of 10 Washington Navel oranges growing at the school is cited. Eight of these trees of ordinary unselected budwood produced an average annual yield of 125 fruits per tree at the ages of 5 and 6, while the remaining 2 trees worked with "record" buds planted 2 years later produced an average of 225 fruits each annually at the ages of 3 and 4. Four of these low yielding trees have now been topworked with buds from the 2 high yielding trees and the same test has been performed between productive and unproductive types of Jaffas.

608. MAGIELSE, M. M. 634.3-1.535  
Het stekken van Japansche citroen en rough lemon. (Cuttings of Japanese citron and rough lemon.)  
*Landbouw*, 1934, 9 : 560-1.

From March 1932 to March 1933 in the experiment station at Ragoenan cuttings of different citrus varieties, especially Japanese citron and rough lemon, were set in seed boxes and in the open ground. Eight hundred cuttings were used of each variety and for each treatment. In

six weeks 60% and 56% of the Japanese citron had rooted and only 4·5% and 7% of the rough lemon. A further trial was made under shade in June-July 1933. The cuttings were made from year-old wood of plants which had been budded and had failed. Of 669 Japanese citron cuttings 87% rooted, while of 4,016 rough lemon cuttings 77% rooted. These rooted cuttings were planted out under shade in September and by December were fit to bud. Sweet lime similarly treated rooted 99%. All the varieties had strong root systems. The advantage of this method of propagation is that the upper wood of unsuccessful buddings which had formerly been discarded can now be used, and becomes available for budding in 5 months instead of 13, and there are no discards of stocks comparable with the 60-70% waste which occurs when they are raised from seed. Varieties of orange were also tried with mostly negative results, the best being the bigaradia with 30%.

609. MAGIELSE, M. M. 634.31-1.541.11-2.191  
 Sour orange en bigaradier als onderstam voor djeroek Manis en Keprok.  
 (Sour orange and bigaradia as rootstocks for sweet orange and mandarin.)  
*Landbouw*, 1934, 9 : 558-60.

Sour orange and bigaradia are shown to be unsuitable as rootstocks in Java either for Washington Navel, Valencias or the local sweet oranges owing to their strong tendency to develop chlorosis. Chlorosis also developed when varieties were double worked, sweet orange or Japanese citron being the intermediate stock, and sour orange the rootstock proper.

610. DE JONG, W. 631.541.11 : 634.441 + 634.3  
 Onderstammen voor mangga and djeroek. (Rootstocks for mango and citrus.)  
*Landbouw*, 1934, 9 : 556-8.

*Mango*.—In 1925 and 1926 at the Pasoeorean experiment station, Java, *Anacardium occidentale* L. (Cashew) and *Spondias dulcis* Forst (Jew plum, Ambarella), were tried as rootstocks for mango and failed entirely. In 1933 about 40 year-old seedlings of *Anacardium occidentale* L. were budded by means of the Forkert method with several varieties of mango again without result. Year-old plants, thumb-thick, of *Lannea grandis* Engl. were budded with 5 different varieties of mango to the number of 30 plants of each variety. All buds were dead in 3 weeks, none having shown any inclination to grow. A similar test using a different method of budding also failed. *Citrus*.—In 1927, 2-year-old seedlings of *Feronia lucida* Scheff were used as a stock for grapefruit, mandarin and sweet orange. The buds were inserted 10 cm. above ground level. The take was very good but the young shoots all turned chlorotic and died off. In 1929 a mandarin was budded on to a *Feronia lucida* stock. At present the growth of this plant is very good, considering its unfavourable position, and there is no trace of incompatibility or disease. In March 1933 the above mentioned 3 citrus varieties were budded on *Feronia limonia* Swingle and on *F. lucida* Scheff. The *Feronias* came from marl land, and were budded at three years old when they had a circumference of about 12 cm. at ground level. The buds were placed on the collar as low down as possible. The take, 65%, was very satisfactory, and some plants have now reached a height of 1·5 metres and are well branched. The only case of yellowing disappeared when the drainage had been improved. The same citrus varieties budded on *Atalantia trimera* failed. On *Aegle Marmelos* Coir, all failed except 10 out of 50 of a Mandarin hybrid. These remained a long time dormant, later made some slow growth and died within a year. A hundred root-suckers of *Murraya Koenigii* Spreng. were budded with these citrus varieties and were planted out in the following dry season in a dry, high lying situation. There was good initial growth, but possibly on account of the drought all the plants subsequently died.

611. WAHLBERG, H. E. 632.183  
 What is a windbreak worth ?  
*Hadar*, 1934, 7 : 220-2.

A comparison between orchards in California protected by windbreaks and orchards having similar environment but without windbreaks showed a difference in the returns of 90 dollars per acre for 1933, a year of comparatively low prices. Protected orchards picked 455 field boxes,

unprotected orchards averaged 371 field boxes per acre., The protected orchards packed 268 boxes and the unprotected 202 boxes per acre. The most useful windbreak appeared to be *Eucalyptus globulus*. There is a dwarf variety *E. globulus nana* which can be used as a filler alternately with the tall variety. Planting distance is 3 to 4 ft. apart in the row.

612. JENNINGS, R. F. 634.31 : 551.56  
**Effect of weather variations in influencing navel yields.**  
*Calif. Citrogr.*, 1934, 20 : 34, 45.  
 In an attempt to establish the effect of weather variations on the size of the crop of Washington Navel oranges the records of the East Highland Orchard Co., California, were investigated. These records cover 21 years and are very complete as regards crop yields, date of full blossom, rainfall, temperatures and other climatic conditions. The trees have been under the same management and in full bearing throughout that period and cultural care has been uniform and consistent. In this investigation every possible condition likely to affect the crop was examined and coefficients of correlation were obtained to the number of 200. For instance correlations were made between yield and such factors as time of full blossom, maximum, minimum and mean temperatures, rainfall, cloudiness, etc. The units of time were 15-day periods throughout winter, spring and summer. The units of yield were field boxes. The most important factor appears to be the average maximum temperature during the 30 days starting a month and a half after the peak of full blossom. At this time the young fruit is very susceptible to heat. The time of full blossom may vary by as much as six weeks, so that the chance of a full crop is greater when the peak of full blossom is early, giving the fruit more time to swell before the hot weather arrives. The factor second in importance is the mean average temperature during a period from mid-February to April 1st. Warm weather at this time was correlated with a heavy crop and cool weather with a poor one. The factor third in importance is the total amount of rainfall during the second and third 15-day periods preceding full blossom. Excessive rainfall during this period had a depressing effect on the crop. The fourth factor is the number of cloudy days during the two months from December 15th to February 15th. The greater the number of sunless days during this period the larger the crop set during the spring. This particular factor appears rather surprisingly to influence the growth rate of the fruit throughout the whole of the following summer in spite of the fact that the fruit is not actually set till some two months after the weather has occurred. In order to test the value of these four weather factors in predicting the yield, a formula was obtained in which the weather data for any season could be substituted to show the probable yield for the season. Tables explaining this are shown. When trial estimates of yields for past seasons based on this formula were made and compared with the actual yields they proved very accurate, the average error being only .39 of a field box per tree.

613. PARKER, E. R. 634.31-1.542.27  
**Some effects of thinning orange fruits.**  
*Bull. Calif. agric. Exp. Sta.* 576, 1934, pp. 32, bibl. 6, being *Paper 287, Univ. Calif. grad. School trop. Agric. Citrus Exp. Sta.*

The results of thinning Washington Navel and Valencia oranges in the year 1930-1 on the crop for that year and on the crop for the following year are examined closely from observations in the field and in the packing house and are submitted to economic interpretation. The thinning of young oranges after the June drop resulted in the case of mature, thrifty, productive trees in larger fruits in the year of thinning but in a smaller total volume of fruit. Generally speaking, under present market conditions in California, a smaller volume of fruit means financial loss despite increased size of fruit. In the second season after thinning the mean size of fruits was smaller than that from the unthinned trees but the total volume was greater. Other things being equal the loss in the first year would be wiped out but no more than wiped out in the second year. It would appear unlikely therefore that thinning will become a general practice in California orchards, though the author suggests that certain groves with a history of large crops of unprofitably small-sized fruit might well stand the experiment.

614. CHAPMAN, H. D. 634.3-1.85

**The phosphate of southern California soils in relation to citrus fertilization.**  
*Bull. Calif. agric. Exp. Sta.* 571, 1934, pp. 22, bibl. 2, being Paper 292, Univ.  
*Calif. grad. School trop. Agric. Citrus Exp. Sta.*

The experiments referred to here show that citrus orchard soils in this area are without exception higher in water-soluble or acid-soluble phosphate than the adjacent unfertilized soils, which points to unnecessarily large phosphatic manuring in the past. Pot and field cultures indicate that citrus may probably be able to get ample phosphate from less available forms and lower total supplies than certain annual crops. The use of phosphate or phosphorus-containing materials in 9 different field trials for periods of from 5 to 20 years has in no case resulted in significant increases in fruit, though the phosphate applied definitely penetrated into the root zone. Phosphatic manuring on the soils in question would therefore appear to be unnecessary except possibly for the benefit of cover crops on calcareous soils.

615. DUFRENOY, J., AND REED, H. S. 634.3-2.19

**Effets pathologiques de la carence ou de l'excès de certains ions sur les feuilles des citrus.** (**Pathological effects of the deficiency or excess of certain ions on citrus leaves.**)

*Ann. agron.*, 1934, 4 : 637-53, bibl. 5.

The affections known as "little leaf" and "rosette" seem to be intimately connected with the zinc ions in the leaves. Leaves affected by mottle leaf show considerable cell disturbance, the palisade cells becoming very unequal, some of them being short and broad of almost equal diameter, while others surrounding them are very narrow and give the appearance of having been compressed by the first named. The actual content of the cells is also quite abnormal. In the opinion of the authors the disease would seem to be connected with the incapacity of the meristematic tissues to utilize the glucides supplied to them with a consequent upset of cell metabolism. Zinc salts have been found to afford at least a temporary cure. They obviously activate the production of chlorophyll and probably photosynthesis. Microphotographs show the state of the cells in a leaf originally suffering from mottle leaf and afterwards treated with zinc sulphate with consequent recovery of its green colour. A second photograph shows the configuration and content of cells of a leaf just beginning to suffer from mottle leaf. Mottle leaf is particularly noticeable in citrus trees which receive their nitrogen in the form of nitrates. Experiments by the authors suggest that the result is due in this case to poisoning by the products of nitrate reduction. It would seem likely that zinc may affect this reaction favourably. A study of the effects of zinc shows that in moderate doses it tends to diminish the quantity of intra-vacuole inclusions, while in doses approaching toxicity it increases their number. In a résumé the authors propose the term "micrometabolism" to designate the field covered by their work. They point out that iron and zinc salts have a specific influence on the assimilatory functions of the leaf. In their absence the cells exhibit pathological symptoms which indicate a break in the equilibrium between the cytoplasm and its inclusions.

616. REICHERT, I., AND PERLBERGER, J. 634.3-2.19

**Xyloporosis. The new Citrus disease.**

*Hadar*, 1934, 7 : 163-7, and 193-202, bibl. 13.

An account of a disease of citrus first recorded in 1930 as "New Disease", to which the name xyloporosis is now given. The external symptoms take the form of pores in the wood and corresponding pegs in the bark. The internal symptoms are cessation of growth of cambium and therefore of the annual rings at the affected spots and the development of a lesion affecting cambium, phloem and xylem. This occurs very largely at the junction of stock and scion. Injury to the tree largely arises from impairment of the junctions of the sieve tubes resulting in an accumulation of carbohydrates which may be compared to the effect produced by ringing. The retardation of photosynthetic activity causes degeneration of the leaves which turn yellow, while the translocation of nutrients from the roots is hindered. Another effect is that the wood cells especially those of the stock do not lignify but remain parenchymatic with the result that

the trunk weakens and bends under a heavy crop. The disease appears to be of physiological origin, though virus is not ruled out. The influence of environmental factors on the disease is very marked.

617. FAWCETT, H. S. 632.8 : 634.3

**Is psoriasis of citrus a virus disease?**

*Phytopathology*, 1934, 24 : 659-68, bibl. 6, being *Paper 290, Univ. Calif. grad. School trop. Agric. Citrus Exp. Sta.*

Symptoms of psoriasis expressing itself as a mosaic like effect on young leaves were noted in 1933. This paper presents the results of observations and experiments bearing on the question whether the disease should be classed as a virus. Observations on leaves, transmission experiments with buds and experiments with rooted cuttings taken from infected trees suggest that the general character of the disease is of a virus nature, being similar to that of leprosis and ring blotch. Further work is necessary to establish this supposition.

618. BELLIO, G. 634.3-2.944 : 632.752

La fumigazione cianidrica negli agrumeti fitti. (**HCN fumigation in closely planted citrus groves.**)

*Ann. Ist. sup. agr. Portici*, 1933, 6 (ser. III) : 1-23.

The author considers the different systems of fumigating citrus trees against scale insects. The normal method of enclosing a single tree in a tent according to the system introduced by Woglum in the United States cannot always be used when the trees are much overgrown with interlacing branches. An alternative method of enclosing several trees under one large, heavy, fairly air-tight tent has not achieved universal success, while Capogrosso's "multiplo-poroso" system, in which a lighter type of tent which is only semi-air-tight is spread over a number of trees, has also not achieved universal success chiefly owing to the fact that the exact dose of HCN necessary has not always been determined and in most cases insufficient HCN has been available to kill the scales. Methods of determining proper quantities of HCN for tents up to 5 metres (about 5 yds. 1 ft.) and with a perimeter of 80 m. (87 yds.) are discussed and no reason is seen why multiple tree tents of the Capogrosso type should not be used successfully until such time as newly planted groves of uniform tree size have replaced the present mixture of large and small trees of which so many groves are at present composed.

619. BELLIO, G. 634.3 : 632.944 : 632.752

Le tavole dosimetriche nella fumigazione cianidrica degli agrumi. (**Fumigation of citrus trees : tables showing the appropriate amounts of HCN to use.**)

*Ann. Ist. sup. agr. Portici*, 1933, 6 (ser. III) : 154-252, bibl. 107.

The author is under no illusions as to the difficulty of determining the reasonable and economic use of HCN against citrus scale insects, but he suggests that the old hit or miss methods are now out of date. He considers that work is still needed on the following points :—the chemicals most suitable for use, e.g. liquid HCN, "powdered hydrocyanic acid", sodium cyanide, etc., and the doses necessary, which must, of course, vary according to area of tree, size of tent, porosity of tent material, susceptibility of scale insect, etc. His aim in the present paper is to determine what doses of HCN are necessary for fumigation tents of definite size, the material being of known, fairly impervious material, the scales of known susceptibility. He first traces the use of HCN as a control in the U.S.A. since 1887, in Spain and in Italy, quoting the tables drawn up at different times and places by such men as Woglum, Peters, Conca, and by the Spanish Commission. Next he discusses at considerable length the volumes of gas which must be evolved under different circumstances of tree and tent, and finally in 6 tables he gives the doses of sodium cyanide (96-98%), water and sulphuric acid which should be correct according to the different volumes of gas required. Further tables give details of how these volumes may be determined. His bibliography would appear to cover the field adequately and to bring our knowledge up to date.

620. MCLEAN, R. R.

632.752 : 634.652

Cleaning scale from avocados.

Calavo News, Nov. 1934, p. 3.

There is usually a certain amount of latania scale (*Aspidiotus lataniae*) on avocado fruit whatever precautions may have been taken. The points to aim at in the mechanical cleaning of avocados are (1) efficiency, (2) no damage to fruit, (3) speed, (4) inexpensiveness. More care is needed with the green than with the dark purple varieties. Two successful methods are rubbing the fruit with fine wet sawdust or with soft rubber brushes such as are used in face massage. The rubber brush appears to exert a suction on the skin which removes the scale without damage to the skin. Bristle brushes however soft often do considerable damage.

The following is also noted:—

NIGAM, B. S. Effect of excessive humidity on the resistance of citrus plant to sun search.

Amer. J. Bot., 1934, 21 : 351-4, bibl. 3.

TROPICAL CROPS.\*

621. GONZALEZ, L. G.

631.532/541 : 633/4

Outstanding results of agronomic and horticultural research.

Philipp. Agric., 1934, 23 : 380-99.

The research referred to in the title is that conducted by the Philippine College of Agriculture during the 25 years of its existence. A few items only can be mentioned there. *Cacao*. Forester proved the most suitable cacao for local conditions. It gave a higher yield under shade than in the open. *Coconut*. Eight fairly distinct varieties were discovered during a survey of Laguna and Tayabas provinces. In propagation fully ripe round nuts were found to be the best, producing better plants and germinating earlier, but the percentage of germination could not be correlated with size and shape. Round nuts produced the most copra and were thinner husked. The rate of growth varied according to age and was directly related to yield. *Coffee*. Studies in variation of yield (in grams) among coffee trees showed maxima and minima between individuals for *robusta* of 6,790 and 369; *excelsa* 10,692 and 800; *liberica* 8,270 and 500. The average yield in fresh berries for the 4,000 trees studied were *robusta* 1.7 kilog., *excelsa* 2.7, *liberica* 2.2. The marketable beans obtained averaged 25% for *robusta*, 15% for *excelsa*, 11% for *liberica*. *Fruits*. The cherimoya proved difficult to establish and the tatemoya was introduced instead. This did well cleft-grafted to the custard apple *Annona reticulata* L. or inarched with atis (*A. squamosa* L.) and guanabano (*A. muricata* L. = Soursop). Avocado selection has resulted in extending the period over which fruit can be obtained from April to November instead of from June to August as formerly. *Averrhoa Carambola* L. A large-fruited sweet form has been selected and can be inarched, shield budded, cleft- and bark-grafted and topworked on the common sour variety. *Banana*. Manurial trials with the Chinese Dwarf banana using different proportions of NPK resulted in 407.50 grams NaNO<sub>3</sub> and 98.60 grams K<sub>2</sub>SO<sub>4</sub> per plant giving the best results and leading to a considerable increase in height, diameter of trunk, number of suckers and weight of bunches. *Chrysophyllum Cainito* L., the star apple, was successfully bark-grafted, inarched and marcotted. It could not be shield budded or cleft-grafted. [Presumably stocks of the same variety were used.—ED.] *Chrysophyllum oliviforme* Lam. did not prove a good stock for *C. Cainito*. *Achras Zapota* L. Storage experiments with the sapodilla showed that 15° C. was the best temperature for storing and ripening green fruits and 0°C. for storing ripe fruits. *Diospyros Kaki* L. The kaki grafted in 1934 on 2-year old seedlings of *Diospyros Ebenaster* Retz. are promising. Rooted plants were also obtained by severing roots and leaving them in the ground till sprouts appeared on the severed section. *Lansium domesticum* Corr. The optimum storage temperature was 13° C.-16° C. This kept fruit in good condition for 13 days. *Mangifera indica* L. The most effective

\* See also 610.

† Hybrid between *Annona Cherimola* Mill and sugar apple *A. squamosa* L.—ED.

method of forcing the mango tree to flower was by smudging. The suitability of the tree for smudging might probably be determined by studies on the catalase activity of the leaves and tissues. Storage trial showed that newly picked matured fruits could be kept for 20 days at 2·2° C. *Carica Papaya* L. The ripe papaya stored well for 3 weeks at 1·1° C. Full grown unripe fruits required a higher temperature than 16° C. to ripen properly.

## 622. LEPLAE, E.

633.51 + 633.73 : 634.6

Développements agricoles récents au Congo belge: coton, café, palmier.  
(Recent agricultural development in the Belgian Congo, cotton, coffee, oil palm.)

*Agron. colon.*, 1934, 23 : 97-109.

The rapid rise to agricultural prominence of the Belgian Congo is described. Some crops are dealt with in detail. *Robusta coffee*. The plantations, all in the hands of Europeans, now cover 30,000 hectares of which 15,000 are in full bearing, producing 12,000 tons. They are mostly situated in the Congo basin at an altitude of 900-1,500 ft. Green manuring is used as a substitute for artificial or pen manures. The yield per hectare is about 1,000 kg. The principal variety of *robusta* planted is one brought from Java some years and renowned for its high yield. Efforts are made by propaganda and otherwise to ensure that the entire *robusta* berries are properly dried or else depulped. Lack of attention to this process gives the coffee a bitter taste which has a serious effect on its market value. The consumption of Congo grown *robusta* coffee in Belgium amounted to 6,500 tons in 1933 out of a total consumption of 40,000 tons. *Arabica coffee*. This is grown mainly round the Great Lakes and at Katanga at an elevation of 3,000-6,000 ft. Its cultivation requires more skill than is needed for *robusta* and this the new Belgian colonists entering the country after the war were not always able to provide. Several varieties are grown including Nyassa, Bourbon, Blue Mountain. Shade, manures and sheltered positions are indispensable. The yield, 600 kg. per hectare, is inferior to that of *robusta*, though the price obtained is higher. The difference, however, does not exceed 1 franc (Belgian) per kilo so that the total receipts per hectare are sensibly less for *arabica*. In Ruanda-Urundi, formerly German, where there is a very large and indigent population mainly occupied in cattle keeping, an attempt is being made to induce every native to grow a few *arabica* bushes in his garden. Shade is afforded by the other crops and cattle manure is available in quantity. Should this scheme succeed the output should eventually be very large. The total consumption of Congo grown *arabica* coffee in Belgium for 1933 was 1,800 tons. *Cotton*. Since 1917 every able bodied native in the cotton growing areas is compelled to cultivate a certain quantity of cotton, and to deliver it to a ginning factory. The price given is fixed by the Government and the proceeds belong entirely to the grower. *Oil palm*. In the palm districts, that is to say, over the greater part of the Belgian Congo, below 3,000 ft. every native taxpayer is compelled to plant 10-15 oil palms (*Elaeis*) annually. These are usually dug out of the forests where they grow in millions and not unnaturally receive little care either in transplanting or in choice of situation. There is consequently a very heavy mortality. A scheme is now under consideration whereby the palms shall be communally planted on suitable land adjoining the villages and shall be established from selected seed or at any rate from seed taken from some local high yielding wild variety. Seed selection experiments at Stanleyville have already produced palms with nuts yielding up to 40% of oil against the 20% of the ordinary variety, while the total weight of bunches per tree per annum has risen from a previous maximum of 80 kg. to 120 kg.

## 623. JANERT, H.

631.62

A new draining machine.

*Trop. Agriculture*, 1934, 11 : 284.

A new machine is described which makes and lays in one operation continuous concrete pipes in the subsoil without preliminary excavation. The difference between this and unsuccessful methods previously tried is that the present machine forms the pipe of dry material and then wets it from the inside, whereas formerly the material had been laid as a wet concrete mixture and

the pipe had choked or lost its shape. It is claimed that the new machine cheapens the production of pipes by 90 per cent. and thus opens up new prospects for subsoil drainage and irrigation. A description of the machine, a diagram of which is supplied, is as follows:—A pair of sledges carry a coulter and a strong share with the mole at its lower end. The steering is done by pulling the drawbar to one side or the other. A hopper contains the dry cement-sand mixture which is forced by means of a positive feed down a pipe behind the share to a plug which forces it out into an annular shape, thus forming a hollow pipe in the tunnel made by the mole. At the same time the inside of the pipe is moistened with a small supply of water delivered by the hollow plug through a porous ring of artificial pumice which is connected to a small reservoir of water by a tube running down inside the share. Sufficient rigidity is thus given to the pipe to hold it in position while it is absorbing enough moisture to set hard. The advantages of subsoil irrigation are recounted.

624. WOOD, R. C., AND HERBERT, A. D. 631.874  
**A note of the sowing of green manure crops**  
*Trop. Agriculture*, 1934, 11 : 295.

Considerable economy in the amount of seed used and ease in subsequent cultivation can probably be attained with large seeded green manures such as *Canavalia* spp. and *Stizolobium* spp. by planting the seed by hand. The technique suggested here is to line up women or children to an old survey chain marked at the proper intervals with tags of cloth. The seeds are planted at the marked intervals, each planter attending to two or three holes, and the chain is then moved on the required distance by a man posted at each end. The spacing for *Stizolobium*, 2 seeds per hole, is 1 ft. × 2 ft. on dirty land (72 lb. per acre) or 2 ft. × 2 ft. on clean land (36 lbs. per acre). *Canavalia* requires double these quantities but may be planted 1 seed per hole. It is estimated that under West Indian conditions hand planting will save 30 lb. per acre over machine drilling and up to 100 lb. an acre over broadcasting or 7/6 and 25/- respectively. Against this is the extra cost of labour estimated at 5 woman days. On the other hand weeding can be rapidly carried out by horse or hand hoe in two directions and possibly in the diagonals as well.

625. ARCHER, W. A. 639.2.089 : 632.951.1  
**Fish poison plants of British Guiana.**  
*Agric. J. Brit. Guiana*, 1934, 5 : 204-6.

About 150 species of plants are used in South America for the purpose of poisoning fish. At least half these plants are to be found in British Guiana. Only a few of them are definitely known and used as fish poisons in the Colony and except for the cultivated ones those used in one district may be unknown in another. A list of the more important species is given of which four varieties have not been mentioned in previous lists.

626. MERCADQ, T. 633.513-1.541  
**Propagation of kapok by budding and grafting.**  
*Philipp. Agric.*, 1934, 23 : 131-9, reprinted in *Trop. Agriculturist*, 1934, 83 : 106-10.

In the Philippines kapok, *Ceiba pentandra*, can be patch budded or cleft grafted, but more success was attained with the former method in the work described here, the ratio being 89% and 70% respectively. The author found that when scion material was scarce he could, by taking buds from the thicker shoots and cleft grafting the thinner ones, obtain from a branch 1 metre long sufficient propagating material to work 50 stocks. There was considerable variation in the length of time taken by the buds to start into growth and in the rapidity of their subsequent growth. The age of the scion was a probable cause but other factors not investigated seemed also to be involved. It was observed that buds from an upright branch developed into upright trees and those from horizontal branches usually were somewhat dwarfed and had drooping branches. A desirable feature of budded trees is their short compact growth and early first

bearing. There is some evidence of rootstock effect in the fact that trees composed of the shy bearing Surinam rootstock and the ordinary free flowering variety as scion only flower at long intervals, whereas when the ordinary rootstock is used flowering is normal.

627. OCFEMIA, G. O. 633.522-2.8

**Bunchy-top of abaca (manila hemp) ; its nature and control.**

*Philipp. Agric.*, 1934, 23 : 174-86, bibl. 4.

This is a virus disease, the vector being the brown aphid, *Pentalonia nigronervosa* Coq. Directions for control are given. There are at present no varieties of abaca known to be resistant.

628. WASSERMANN, J. 633.525.1

**Cultivation of ramie in Transcaucasia.**

*Int. Rev. Agric.*, 1934, 25 : T390-3.

The total area now under ramie (*Boehmeria* sp.) in Transcaucasia is 1,500 hectares. A few years ago no plantation existed at all. Former plantations have hitherto eventually been abandoned owing to the absence of cheap methods of decortication and of a secure demand. With the invention of a new type of decorticating machine the situation has changed. The centre of the cultivation is in Western Georgia where there is an abundant rainfall and a climate that is almost subtropical. The plantations are all state or collective farms and the whole problem is bound up in the reclamation of 96,000 hectares of swamp land. An experiment station to deal with the problems of ramie cultivation has been established at Nosiri, Western Georgia, and some useful data have been obtained. The seed is sown or rhizomes transplanted in late April or early May. In the seed beds spacing should be 5 x 5 cm., the necessary thinning out being done 20-25 days after germination. The rhizomes, when these are used for propagation, are cut 5-6 cm. long with 6-8 buds. Spacing in the field at final transplantation is 35 cm. between plants and 90 cm. between rows. Manurial experiments gave some striking results. A complete manure gave an increased yield of dried stems without leaves of 7½ times the control plot or 4.25 tons per ha. Nitrogen + phosphorus gave a 5.66 per cent. increase, phosphorus + potash much less, while nitrogen + potash differed only slightly from the control plots. The manuring had also a qualitative effect, the length of single fibre from the NPK plot averaging 72.20 while that from the control averaged only 58.62 mm. The following year the residual effects of phosphorus gave a fivefold yield over the control plot. Basic slag was very effective. Saltpetre gave a large increase the second year in spite of heavy rainfall. Liming the soil increased the yield 46 per cent. Selection is still in its early stages and is directed towards hardiness and quality. A few pests and diseases are named.

629. NORRIS, R. V. 633.72

**Review of the activities of the Tea Research Institute of Ceylon.**

*Tea Quart.*, 1934, 7 : 45-55.

A few of the major problems are discussed. An investigation of the effects of various types of pruning, clean pruning, cut across, and rim-lung pruning has shown that in the case of low country tea the use of rim-lung pruning as against clean cut has reduced the number of deaths after pruning by 87% and the amount of pre-tipping die-back by nearly 50%. Manurial experiments have made it clear that no significant difference in yield will result in teas whether treated with blood meal, ammonium sulphate or cyanamide nor any difference in quality between teas treated with organic and inorganic nitrogen respectively. The decisive factor is the amount of nitrogen applied and not its kind. No effect has been produced by the addition of potash. In the search for a suitable cover crop for up country conditions to reduce erosion and to supply a green manure, *Trifolium subterraneum* has shown the most promise. It has a moderate root system, is drought resistant and has survived a severe rainy season. As high shade *Calpurnea aurea* is promising while *Hakea saligna* makes a good wind break. In mycology the cause and cure of witches broom is still undetermined, but evidence points to the conclusion that such symptoms may arise from such diverse causes as wood rot, the slow attack of a root disease, the presence of slab rock in the soil or even adverse climatic conditions. Entomology

has focussed on the control of *Tortrix* and nettle grub. The difficulties in the way of biological control by the egg parasite *Trichogramma* have proved to be the cost of artificial breeding and the slow progress of the parasite when released. Nettle grub has been checked but not eliminated by wilting, soap spraying and the regular collection of cocoons, success depending on dealing promptly with initial outbreaks. Detailed investigations are being made in every aspect of tea manufacture.

630. RAMOS, P. 633.72

***Thea assamica.***

*Bol. Agric. Zootech. Vet. Minas Geraes*, 1934, 7 : 21-4.

The essential characters of a good tea are described and it is stated that these are possessed to the full by Assamica. The suggestion is made that this tea should become the principal tea grown in Brazil and the way in which this could be accomplished is outlined.

631. GOUBEAUX, J. 633.72

Observation sur la culture du théier en Indochine. [Notes on the cultivation of the tea plant in Indo-China.]

*Rev. Bot. appl.*, 1934, 14 : 865-73.

I. *The teas of Indo-China.* The classification of the numerous local varieties of tea is discussed. The most important variety is that known as Shan. It was discovered 30 years ago and is now fairly widespread, and though different types are arising certain fixed characters will always identify it. Among these are the unusual length of the shoots and the extraordinary whitish pubescence which descends to the third or even to the fourth leaf. There were two research stations occupied exclusively with this tea. One at Phu-ho, Tonkin, still exists, the other at Tran-ninh, only established in 1929, has been given up for reasons of economy. II. *Cultivation before 1924.* Research on tea in Indo-China up to 1924 was, according to the author, erratic and unskilled. To counteract this the planters introduced methods and personnel from Java but these proved unsuitable for the conditions of the country. Later, however, a number of new research stations were established or old ones reopened and considerable progress is now being made. III. *Cultivation after 1924.* Since 1924 the varieties Assamica and Shan are proving the most successful. The various soils of the country which are suitable for tea growing are discussed and the comment is made that, whereas it has taken the Dutch years of scientific work to evolve a tea which even now is not highly esteemed on the market, the growers of Indo-China were fortunate in producing a valuable tea at the outset. The reason for this is that Indo-China is a natural tea country whereas Java is not. A leguminous green manure which has given excellent results is *Desmodium ovalifolium*. It forms a dense cover which renews itself and grows vigorously even in the shade of close plantings. The ideal shade tree still remains to be found. An interesting innovation at the Research Station at Phu-ho is the use of a cellar for fermentation. This ensures an even temperature and humidity, two essentials of good fermentation, and enables artificial ventilation and the use of hot water to be dispensed with. IV. *Indo-Chinese teas and the world crisis.* In this section green tea only and its possible markets are discussed.

632. WELLENSIEK, S. J. 633.72-1.521

De praktische uitvoering van theeselectie. (Practical application of tea plant selection.)

Reprint *Bergcultures*, 1933, 7 : 1270-7.

The selection of improved forms of tea plants is quite possible. It has been found from trials with the collections of tea varieties in Java that they will all produce from seed a greater or less number of exceptionally good plants. The plants may be selected as parent plants in the plantation or in the nursery. Field selection has the advantage that a number of factors can be taken into consideration, whereas nursery selection is done entirely by size and weight. To form a nucleus 20% of the whole should be chosen, but they must be markedly above the average. There will even then be a great variation between the yields of selected plants. An

objection to nursery selection by size and weight is that the unselected plants have to be discarded when they are already of some size. To overcome this a method is suggested whereby the selection can be made when the plants are six to eight weeks old. This is selective thinning. A sowing with plants  $8 \times 10$  cm. apart is selectively thinned till only 20% remain or, if the sowing is  $10 \times 10$  cm., until 25% remain. Very narrow beds should be used or the outside plants will have an advantage which may mask their real character. *Field selection.* The principles of this method are laid down. They are fully discussed in the abstract of a paper by the same author no. 634 of this issue, so are omitted here. Vegetative propagation when required can be achieved by budding by the Forkert method. Union is effected in about 3 weeks, and 10 days later the top of the stock is cut off 2-5 cm. above the bud. The plants resulting from these buddings must undergo further trials, both in groups and subsequently as individuals. By this method very high yielding strains could be worked up. Budding can also be used to convert existing trees. In this case the bush is cut back to within 15 cm. of the ground, and when the new growth is 1-2 years old it can be budded. The working over of plants which yield badly is not recommended as the root system is often weak. If the propagation of selected plants is decided upon, about 100 of the best trees should be chosen from the plantation. These are budded on to nursery plants and the best are planted out in the following planting season. The wood pruned on this occasion will be used for propagation. There will be a subsequent pruning a year later, when the wood can again be used for further propagation. Three and a half years from the original selection of the parent trees the final reselections from the clonal offspring will be made and these plants will be the clonal plants from which large scale propagations will be made. The surplus budwood can usually be sold.

633. WELLENSIEK, S. J. 633.72-1.521  
*Onderzoeking over quantitatieve thee-selectie I. (Researches on quantitative tea-selection.)* [English summary.]

Reprint *Archief Theecult. Ned. Ind.*, 1934, 8 : 9-37, bibl. 8.

The paper is the first of a series on plucking experiments with tea. The objects in this instance were (1) to study the individual yield of tea plants as a basis for selection, (2) to investigate the value of nursery selection, (3) to study the influence of position on yield, (4) to study the so-called plantation efficiency. What are known as reform-seed gardens are those laid out to supply selected plants for the plucking garden. The 20% heaviest plants are chosen from these nurseries or seed gardens and transplanted to a trial plucking garden, the bad yielders are weeded out and the final selections are transplanted to furnish propagating material either by seed or asexually. It was found that a nursery selection of 20% means an average increase in yield of 31.4% over the standard plants while the extremely close selection of only 1.83% means an average increase of yield of nearly twice as much. In this trial the average yield of the border plants was less than that of the centre plants. This is unexpected and it is thought the garden being not yet sheltered the external bushes suffered most from climatic conditions. Efficiency investigations showed the desirability of selective thinning out and replacing with high yielders. A selective thinning out of 10, 25, 50, 75 per cent. of the lower yielders resulted only in a temporary loss of 2, 8, 25, 50 per cent. respectively.

634. WELLENSIEK, S. J. 633.72-1.521  
*Principes voor het selecteeren van moederboomen bij thee. (Principles of selection of parent plants in tea.)*

Reprint *Bergcultures*, 1934, 8 : 894-902, bibl. 3.

The object of selection is to obtain clonal plants from which improved strains may be propagated. Selection is made for yield and quality. The variability of individual yield is discussed. The standard to aim at is that the average minimum yield of a group of selected parent trees should be three times greater than the total average yield for the whole garden. An example of this is given. In a garden of 4,525 plants 200 were selected by eye and their yield checked during 8 pluckings. Their average yield was 400.2 gr. while that of the whole garden was 177.8 gr. The selected trees thus gave an increased yield of 125.1%. The selected plants were then

reselected and 29 plants were found whose yield showed an average of 262.3% greater than the average for the whole garden. These plants will undergo yet further tests. Groups of 4,000 trees are the least which should be used to select from and an even greater number if the plantations are high yielding. Instructions for selection by eye are given. [See *Arch. Theecult. Ned. Ind.*, 1932, 6 : 123-32, *H.A.*, 1933, 3 : 3 : 383.—Ed.] where the details of this method are described by the same author. The number of pickings necessary to ensure an accurate test is discussed. Five or six pickings give so high a degree of accuracy that the expense of a greater number seems unnecessary. Criteria for the selection of parent trees are summed up as follows:—(1) A minimum yield of three times the total average of the plantation. This standard should only be deviated from in cases where there is already a very high average yield and then only if the conditions in 3 and 4 are satisfied. (2) The number finally selected should not exceed 1% of the total number of plants. (3) A definite yield of at least 50 grams per picking. (4) The selected plants must take a high place in the frequency distribution of the whole. (5) A regular yield at each picking. It is emphasized that selection by eye must be followed by definite individual trials or disappointment may easily result. Selection for quality is made from trees already selected for yield or by testing the prepared leaf from small groups of plants and then of individuals from the groups which have shown superiority. The difficulty of making a fair sample of tea from the leaf of one bush is overcome by propagating the individual vegetatively until enough clonal plants are available to supply an adequate amount of leaf.

635. KVARAZKHELIA, T. K.

633.72-1.534

*Vegetative propagation of the tea plant.*  
*Trop. Agriculturist*, 1934, 83 : 199-211.

The work here reported was carried out at the Tea Research Institute of the U.S.S.R., Ozurgeti-Anasenli, Georgia. The first few pages are occupied with a discussion of the advantages of vegetative propagation of tea. The methods of propagation tested were:—mound layering, with and without wire ringing or bark removal; simple layering in which the lower part of the shoot was bent down, covered with earth, and (a) wounded, (b) not wounded, (c) with a small addition of potassium permanganate to the soil, the upper free ends of the shoots being fastened to vertical pegs; continuous layering in which the whole shoot is pegged down in a trench 10 cm. deep and 7 cm. wide, the internodes being covered with earth and the nodes and bases of the shoots of 3-5 leaves being left uncovered (numerous shoots arising at the nodes produce roots and are ready for transplantation at the end of the year); the so-called Dahlem method, in which the bush is cut down to ground level and the shoots which subsequently push out are wired at the base and mounded. All these methods were extremely successful and wiring and wounding were found to be unnecessary. The best results, approx. 100% success, are obtained with 1- and 2-year-old shoots. The soil should be moist but not waterlogged. Roots left uncovered for the purpose to a depth of 10-15 cm. produced shoots. The roots each with shoot attached were subsequently cut into sections and transplanted. This method, however, weakens the tree. The method of simple layering from bush to bush has been used to transform the isolated tea bushes into continuous espaliers, a method of planting which is now adopted to prevent erosion. The subsequent growth of transplanted layered plants was vigorous, 94% succeeding as against 30-50% of transplanted seedlings. It is necessary, however, that the soil to receive either class of plant should be properly worked until a fine tilth is secured, and the plants must be watered immediately after insertion. Other methods of propagation will be dealt with in succeeding articles.

636. WELLENSIEK, S. J.

633.72-1.535 : 581.144.2

*Beworteling van thee-stekken. (Root formation of tea cuttings.)* [English summary.]

Reprint *Arch. Theecult. Ned. Ind.*, 1933, 7 : 1-16, bibl. 25.

Ringing young shoots with a thin iron wire followed by earthing up results in an average root formation of 80%. The following conclusions were drawn from experimental data:—(a) Root

formation will not result from wire-ringing alone ; (b) root formation will sometimes result from earthing up alone ; (c) the two processes in conjunction give good results ; (d) decrease in the transport of food substances above the wire-ringed area (which was brought about by 1 or 2 extra rings 8 cm. apart higher up the shoot) results in decreased rooting ; (e) root formation will not take place in the absence of leaves above the wire-ringed area. Other methods which gave some though less satisfactory results were the use of etiolated cuttings, of relatively thick hardwood cuttings which are not planted for two days after being cut, and of nurse root grafts. Each process is photographically illustrated.

637. TASCHDJIAN, E. 633.73  
 Identificazione fisiologica di differenti linee di *Coffea arabica*. (Physiological identification of different strains of *C. arabica*).  
*Agricoltura colon.*, 1934, 28 : 428-31.

Considerable difficulty having been experienced in identifying the Street and the Timpont strains of *C. arabica*, the latter being more resistant to *Hemileia vastatrix* than the former, the assimilation, the absorption and the transpiration of both strains were tested. It was found that Timpont possesses a rather higher osmotic concentration than Street and that its transpiration rate is very much greater. By transpiration tests made with leaves exposed under identical circumstances for equal periods it should be easily possible to differentiate between the two.

638. CRAMER, P. J. S. 633.73-1.541  
 Early experiments in grafting coffee in Java.  
*Emp. J. exp. Agric.*, 1934, 2 : 200-4.

The earliest attempts at grafting coffee in the Dutch East Indies, about 1895, were undertaken not to improve yield but to combat nematode attack to which *Coffea arabica* was very susceptible and to which *C. liberica* was immune. The results were not very successful and the work was discontinued. A successful graft plantation of several hundred acres was worked up by van Riemsdyk and was in full bearing in 1906 of a chance *arabica* × *liberica* cross known as the Kalimas hybrid. The method then used to conserve humidity was to raise the grafts in holes in the ground, covered with a glass plate. The modern method is to use glass or waxed paper tubes. It was soon discovered that grafts made from branches with the ordinary dorso-ventral habit of growth developed into flat shrubs, shoots from main stems with a radial habit of growth formed normal trees, and adventive or upward growing shoots from normal primary branches developed a shrubby habit. There is evidence that trees from normal sucker or top shoot growth were more susceptible to leaf disease (*Hemileia vastatrix*) than branch grafts. Coffee species are difficult to graft, but if either graft or stock is a vigorous hybrid there is usually no trouble. In 1914 the second period began with the establishment of a coffee experiment station at Bangelan, when attention was turned to producing clonal plants for use as scions. A museum field was laid out consisting of several hundred plots each holding 16 trees of one clone. The most promising clones were again planted in groups of 49 trees and from the best of these fields of 1 ha. containing 1,111 grafts were laid out. Incidentally the sale of seed from these clones paid for the upkeep and extension of the gardens and left a substantial sum over. The best rootstock, although the seedlings were variable, proved to be a hybrid between *robusta* and Quillou called Robusta 124·01. Clonal plants of this stock were established for seed production. By selection of suitable clones it was found possible to spread the picking season over a longer period and so enable the drying factories to deal with a larger quantity, and it allowed of a successful control of the berry borer because the clonal block, with the trees synchronized in their cropping, could be stripped of berries for a period. When circumstances no longer admitted of time being spent on artificial pollination, chance hybrids were obtained by taking the seed from a mixed plantation of the best clones especially set out for the purpose and grafting any resulting seedling which looked like a hybrid on to the suckers of old cut back trees. Results were obtained a year earlier than by nursery grafting, and any hybrid that showed valuable characters was then propagated by grafting in the ordinary way.

639. PATERSON, A. W., AND REED, R. L. 633.74  
**Variation in the size of Trinidad cacao beans and methods of its assessment.**  
*Trop. Agriculture*, 1934, 11 : 252-61.  
The number of cacao beans required to fill a Capstan cigarette tin level full, any projecting beans being rubbed off with a light ruler, has proved a useful index to size of bean and therefore to standard of quality on the Gold Coast. [Any similar container of a standard size could of course serve the purpose equally well, once its capacity had been determined.—ED.] The same simple statistics are here shown to prove equally valuable in the case of the more heterogeneous Trinidad cacao and a scale for estimating the average thickness of a sample of Trinidad cacao is postulated. The system can be worked by unskilled labour with the minimum of equipment.

640. PARK, M. 633.74-2.19  
**Further notes on cacao disease in the Dumbara valley 1933.**  
*Trop. Agriculturist*, 1934, 83 : 78-86, bibl. 2.  
A newly observed disease of cacao trees in Ceylon is described and discussed. The symptoms are the wilting and subsequent death of all the leaves, which do not fall but remain on the branches. The cortex of the trunk becomes slightly discoloured, has a fermented smell, and finally turns brown and dries up. The small feeding roots are dead and dried by the time the first symptoms of wilting appear, while the large roots die later. The environmental conditions of this disease in Ceylon appear to be of a similar nature to one which has recently destroyed large numbers of trees on the African islands of St. Thomas and Prince's Island and has now been attributed to the incidence of fluctuating extremes of temperature and humidity caused by sudden deforestation and a lack of exchangeable lime in the soil. Ceylon soils suffer from lack of exchangeable lime and the climatic condition in the Dumbara valley where the disease appeared consisted of an exceptionally dry year followed by a very wet one. Recommendations for combating the disease consist of the provision of adequate high shade to increase humidity and if possible of a ground cover crop. Soil conditions may be improved by the use of lime, cattle manure and green manure.

641. CELINO, M. S. 633.88-2.411  
**Blight of Cinchona seedlings.**  
*Philipp. Agric.*, 1934, 23 : 111-23, bibl. 6.  
A disease which seriously damaged a number *Cinchona* seedlings was found to be *Phytophthora Faberi* Maubl., the fungus which causes bud rot of coconut, citrus blight, fruit rot and root rot of papaya. In this instance it was controlled without difficulty with bordeaux mixture 4-4-50.

642. DA SILVEIRA, J. C. 633.883.2  
Contribution à l'étude du pulghère aux Iles du Cap Vert. (**A study of the physic nut in the Cape Verde Islands.**)  
*An. Inst. sup. Agron. Lisboa*, 1934, 6 : 1 : 116-26, and without the diagrams in *Bull. Inst. colon. Marseille Mat. grasses*, 1934, 18 : 262-7.  
The cultivation of the physic nut (*Jatropha Curcas*) occupies 16% of the cultivated lands of the Cape Verde Islands. The yield is between 200-800 kg per hectare. The oil from the seed and the ash of the plant are made into soap both locally and in Portugal whether it is exported. The residue remaining after the extraction of the oil is used as manure. It is mixed with superphosphate for corn and maize and with sulphate of potash and superphosphate for vines and potatoes. Unmixed it contains 3% nitrogen and 1.5% phosphoric acid. The percentage of oil in the part of the seed surrounding the kernel is about 31-37% of the dry matter and in the kernel about 52-57%. The oil content varies slightly with the locality and is a little less than that obtained from seeds grown in Mozambique and Angola.

643. DUFRENOY, J. 633.913  
 Le caoutchouc de Guayule (*Parthenium argentatum* Gray). (Guayule  
 rubber.)

*Agron. colon.*, 1934, 23 : 168-72, bibl. 2.

The plant which is of shrubby growth inhabits the semi-desert regions of California and N. Mexico. Until recently methods of extraction of the latex were not sufficiently perfected to eliminate impurities and consequently the product was inferior to commercial rubber. This difficulty has now been overcome, and although the rubber cannot compete commercially with imported rubber obtained from *Hevea*, it does form a potential source of supply should the imports of foreign rubber ever be cut off. To obtain coagulation, without which the latex remains in suspension in water, the plant has either to be plunged in some solution which will kill the cells or, as is more usual, left to dry after being cut until the latex is no longer in a state of colloidal suspension. The stems are then cut into small pieces and rotated in drums containing water. The latex is thus squeezed out and forms into floating masses which are easily collected. The plants are very variable in their latex content but heavy yielding, disease resisting strains have now been obtained. The planting in the field of nursery raised seedlings is done by a machine in such a manner that perfect alignment and spacing are obtained in each direction and mechanical cultivation is thereby made possible. There are peak periods at which the latex content is at its highest, and these are most pronounced when the plant has been grown under conditions which provide a period of rapid growth followed by a much longer period of desiccation. Plants grown under their natural desert conditions without irrigation are poor in latex compared with those under cultivation.

644. CRAMER, P. J. S. 633.912-1.521  
**Rubber. The use of improved planting material. IV. Seedling selection.**  
*Trop. Agriculturist*, 1934, 83 : 3-7.

Dr. Cramer here develops the theme alluded to in an earlier section (*Ibidem*, 1934, 82 : 278-80 and 332-7, *H.A.*, 1934, 4 : 3 : 470) that the planting of clonal budded rubber may eventually be superseded by the use of seedlings from clonal plantations with a consequent saving of expense and without any diminution of yield. At present, however, the author is convinced that the most productive planting materials are the buddings of the well-known high yielding clones. Artificial pollination is too difficult and complicated and the average of seed production (5 per cent. of the number of flowers treated) is too low for artificially pollinated seed ever to be produced in large enough quantities for commercial planting. Plantations of mixed clones have been set in isolated places with the object of producing hybrids which will combine useful characters of both parents. The objection to this is that it is always uncertain which parent has furnished the pollen and that it is difficult to distinguish the seeds of any particular clone as they lie on the ground. Monoclonal plantations yield seed freely, there is no chance of mixing the seed, and the characteristics shown by the seedlings from these trees will be constant. The use of mixed clonal plantations for seed production is therefore undesirable. Large plantings of buddings and seedlings from the same clones of equal age showed a higher average yield for the buddings, but the average yield of the best 25% of each gave better results for the seedlings. It is shown how theoretically it should be possible to arrange a new seedling plantation so that at any rate not more than 30% of the best seedlings remain, which should give a higher yield than a similar proportion of vegetatively produced clones. To achieve this a close planting of 290 trees per acre spaced 10 x 15 ft. is suggested. According to Mann of the Rubber Research Institute, Malaya, a true measure of the productivity of a tree can be obtained by tapping it for 10 days and measuring the yield for the last 5 days, resting it for 6 months and then applying a similar test. This test would be used to eliminate the poorest yielders up to say 25% of the original stand beginning when the trees are 3 years old. To arrive at a final stand of mature trees of .70 to the acre, thinning out of the lowest yielders would proceed during commercial tapping. The need for keeping a fairly even spacing will make it impossible to achieve an absolute best 25%, but allowing for this a best 30% should not be difficult to obtain. Another system under trial for detecting the highest yielders is based on the principle that high yielders are born not made and

that no amount of attention will turn a low yielder into a high one. Thus the high yielders can be detected in the nursery and this is done by pressing into the bark a set of V shaped knives fixed on a strip of metal (British patent 309·90 f), and judging the capacity from the resulting stream of latex. According to results the plants are divided into five classes of which only the best class is used. This system can be applied to direct planting. Germinated clonal seeds are sown 9 to a hole or in double rows 1 ft. apart each way in trenches 15 ft. apart. In a year the nursery tapping test is applied and continued at intervals until the spacing stands at 9-12 ft. in the rows or, if in holes, till all but the best tree has been removed. Exceptionally high yielders unsuitably placed can be transplanted to vacancies. Future thinnings proceed, as the trees grow, on the lines indicated in the earlier part of the article.

645. PIERIS, W. I.

633.912-1.541.5

**Further notes on the after treatment of budded rubber stocks.***Rubber Research Scheme Ceylon, 1st quart. circ. for 1934, pp. 20-6.*

A report of the results of an experiment laid down some 14 months previously to determine (1) the most effective method of treating budded rubber whose cut surfaces had started to decay before the union had had time to callus over completely, and (2) the most effective method of treatment of budded rubber stocks at the time of cutting back, in order to prevent decay occurring. There were 12 plants allotted to each of 6 treatments including 2 controls in part 1 and 24 plants to each of 7 treatments including 1 control in part 2. The treatments are omitted here for lack of space. The resulting recommendations are :—Preventive. Avoid leaving the stock snag to decay and when removing it cut right down to the live wood at an angle of 45 degrees to the horizontal. Disinfect the cut surface immediately and every six months subsequently, avoiding the growing callus, with a 10% solution of Brunolinum plantarium and paint over next day with Skenes pruning mixture or other waterproof covering. Ensure vigorous growth by adequate cultural measures. Remedial. If the decayed cut surface of the budded stock leaves no hollow on cleaning out with a knife, disinfect with 10% Brunolinum plantarium and apply a waterproof covering compound. If a hollow is left, disinfect as before and plug with a mixture of colas and coir dust 1·5 : 2.

646. WILTSHERE, J. L.

633.912-1.541.12 : 678.11

**Variations in the composition of latex from clone and seedling rubber.***Bull. Rubb. Inst. Malaya, 5, 1934, pp. 61, bibl. 41.*

Pages 2-16 consist of a survey of the literature on causes of variation in composition of latex classified under the following heads—variation due to undefined causes—variation within and between individual trees—effect of different conditions on composition of latex such as environmental, seasonal and hereditary factors, age of trees, pollarding, and tapping methods. Pages 17-52 contain reports of experiments comprising No. 1 (a) comparison between high and low tapping panels, (b) seasonal variations and comparison between clones, (c) comparison between constituents and/or properties. No. 2. Comparison of double and single-cut tapping on young budded trees. No. 3. Day to day variations in dry rubber content and viscosity, (a) daily alternate monthly tapping, (b) alternate daily and third-daily tapping.

647. MILSUM, J. N.

634.1/7

**Fruit cultivation in Java.***Malay. agric. J., 1934, 22 : 313-28.*

The article is a result of a visit to Java by the author in April-May 1934, for the purpose of studying experimental fruit cultivation in that island and in Sumatra. There are three fruit research stations at different altitudes in Java and some thirty trial plots and experiment stations with some 12 European officers engaged in fruit work in Java and Sumatra. The whole is controlled by the Horticultural Bureau of the Department of Economic Affairs. All fruit trees are propagated asexually and it has been possible to get together a representative collection from the best fruit trees in the country. Shows are regularly visited and any outstanding fruit traced back to its parent tree which is subsequently propagated for trial. Final selection is rigorous. Propagation is almost entirely by budding, using the modified Forkert method on seedling

rootstocks. The question of suitable rootstocks for such imported non-indigenous fruits as citrus, mango, and avocado pear has required considerable research. Certain trees have not proved amenable to budding, notably the mangosteen. Seedling stocks are first raised in nursery beds, the preparation of which is described in detail. The age at which the stocks are best budded varies from 6-22 months according to variety, the majority being ready in 12 months. Citrus seeds are sown point downwards to ensure straight tap roots. During the seedling stage until transplanting, which is done six months after germination and before budding, the seed bed is completely enclosed in a covering of white cambric raised 2 ft. above ground to ward off the leaf miner *Phyllocnistis citrella*. Generative, weak and deformed seedlings of the Japanese citron and rough lemon, the varieties most used as rootstocks, are weeded out leaving fit for use 30 per cent. and 70 per cent. respectively, all of vegetative origin. Rootstock trials are in progress in particular to discover a suitable stock for grapefruit. The methods of citrus cultivation in Java are described.

648. VIVOLI, G. 634.421  
*Un arbre fruitier : le Feijoa Sellowiana. (Feijoa Sellowiana.)*  
*Rev. Bot. appl., 1934, 14 : 673-4.*

*Feijoa Sellowiana*, the pineapple guava, a native of Uruguay and the Argentine, has been introduced into Tripoli with some success. The small, oval, green fruits are sweet and slightly aromatic with a taste which is described as being midway between strawberry and banana. The tree is resistant to heat and also to drought, but in the latter case the fruits become woody and ripening is delayed. If properly irrigated the yield and quality are greatly increased. Flowering takes place in April and lasts a month. There is some discussion over the manner of its pollination, both bees and humming birds having been named as the agents. In Tripoli there are no humming birds and few bees, but pollination is somehow achieved. At experiment stations in Tripoli where bees are kept they are found to visit the flowers. The fruit ripens in succession during October and November. A tree five or six years old will give about 4 kg. of fruit.

649. JAGOE, R. B. 634.6 : 581.46  
*Notes on the oil palm in Malaya with special reference to floral morphology.*  
*Malay. agric. J., 1934, 22 : 541-9, bibl. 22.*

The palm which is the subject of this study is that known as the Deli type (*Elaeis guineensis* var. *communis* forma *dura*, Becc.). This palm is the type grown on the estates in Malaya. A minute description is given of the general structure, habits of growth, morphology of the flowers and development of the fruit. Every sentence in this paper is a concise and pointed statement of fact.

650. ALTSON, R. A. 634.6-2.19  
*Fruit-rot or bunch-rot of the oil palm.*  
*Malay. agric. J., 1934, 22 : 360-6.*

A rot affecting the fruit bunches of certain high-yielding strains of the oil palm has recently become prominent in Malaya. Four main types are distinguished, namely base-rot of the fruit, stigma-end-rot of the fruit, bunch-end-rot in which the distal end of the bunch decays, and early bunch-rot in which the whole bunch decays at an early stage. This last development is liable to be confused with the normal decay of unpollinated bunches. All four types are shown to have a common origin. The disease appears to be caused by a saprophytic invasion of tissues predisposed to attack by a decline of resistance due to a nutritional disturbance brought about by a soil deficiency and aggravated or induced by artificial pollination. It is recommended that high yielding trees that have difficulty in maturing full crops of naturally pollinated bunches should not be artificially pollinated. Manurial treatment is indicated but lack of data makes specific recommendations inadvisable. The removal of rotting bunches might prevent useless translocation of material, but would probably do little to reduce the abundant associated saprophytes. The rotten fruit if allowed to enter the factory will impair the oil by increasing the acidity.

651. DUPONT, R. 634.61 : 658.8  
 Examen comparatif des méthodes en usage à Ceylon et aux Seychelles pour la culture du cocotier et la préparation du copra. [Comparison between methods employed in Ceylon and in the Seychelles in coconut cultivation and copra preparation.]

*Bull. Inst. colon. Marseille, Mat. grasses*, 1934, 18 : 229-41, reprinted from *Rev. agric. Maurice*, volume and date not stated.

In both countries close planting is too much in evidence, 18 ft. apart being quite usual against the 30 ft. interval which is customary in Malaya and in the large plantations in Ceylon. The results of these conditions can be seen in the copra yield returns. The properly spaced plantations obtain 800 kg. per arpent whereas in the crowded native plantings of Ceylon and the Seychelles the yield falls as low as 200 kg. In the latter country too there is a custom of mingling three sizes of palms as well as useless undergrowth in the one plantation. There are only 14 insects harmful to coconut in the Seychelles (Malaya has at least 84), and of these the rhinoceros beetle (*Rhyncophorus ferrugineus*) does less damage here than it does elsewhere chiefly owing to the fact that all available dead wood is removed for use in the distilleries. Cover crops are little used as such in Ceylon or in the Seychelles, but *Desmodium* and *Asystasia* are grown as fodder under the palms. In Ceylon native plantations coconuts are manured once a fortnight by tethering two cattle near the trunk during the night. The dung is placed in a shallow trench round the tree and mixed with debris from fibre factories. In the Seychelles there are not sufficient animals to render this possible and debris from the cinnamon factories is used instead. The author advises the use of the large guano deposits in the islands in combination with vegetable debris. Manuring with artificials which was common in Ceylon before the financial crisis is not practised in Seychelles. The result of a balanced artificial manure is, the author says, to raise the yield of nuts from 30 to 75 per tree. In the manufacture of copra the Seychelles methods are modelled on those used in Ceylon in 1903. There is, however, no machinery for producing oil from inferior copra as is done in Ceylon. In Seychelles the copra from the outlying islands, where the soil is heavy coralline sand and the rainfall low, is allowed to dry naturally in the sun and is considered to be superior to copra from the granitic islands which has to be dried in the factories.

652. EDWARDS, W. H. 634.61  
 The health of coconuts in Jamaica.  
*J. Jamaica agric. Soc.*, 1934, 38 : 535-47.

The poor condition of many of the coconut trees in the island and their susceptibility to disease is attributed to unsuitable environment and lack of cultivation. The reasons why these conditions have arisen are discussed.

653. BELGRAVE, W. N. C., AND LAMBOURNE, J. 634.61-1.8  
 Experiments on the cultivation and manuring of coconuts in Malaya.  
*Malay. agric. J.*, 1934, 22 : 511-7, bibl. 4.

An account is given of experiments in progress on seven coconut estates. The yields from mature coconuts 10-20 years old on normal soil not overdrained were not increased to an economic degree by manuring, liming or clean weeding. Unmanured plots with the cover controlled were equally productive. On a poor light soil large responses to clean weeding and the application of manures and lime were obtained, but owing to a heavy drop in yield in 1934 definite conclusions are not yet drawn. Where the soil is dry a cover crop may retard both young and older palms. Liming proved of benefit in an acid soil pH 2.0-3.5. The results are tabulated and statistically analysed.

654. PARK, M. 634.61-2.112  
 Some notes on the effects of drought on the yield of coconut palms.  
*Trop. Agriculturist*, 1934, 83 : 141-50, bibl. 5.

From the examination of yield records from a group of coconut estates in the Puttalam district, Ceylon, it is shown that a severe drought in 1931 affected the yield of nuts for a period of two

years with a maximum effect about 13 months after the conclusion of the drought, at which time the yield had sunk to about 30 per cent. of the average for seven years. A sharp rise in yield during the drought is thought to be partly due to the physiological shedding of nuts approaching maturity. The size of nut as indicated by the amount of copra per nut was decreased for one year only with a maximum effect about six months after the end of the drought.

655. COOK, F. C. 634.61  
**The relationship between weights of coconuts, husked nuts and meat.**  
*Malay. agric. J., 1934, 22 : 539-40.*

A high correlation was shown between weight of husked nut and meat. The splitting of the husked nut to eliminate any possible variation due to amount of water contained in each nut was found to be unnecessary and this source of variation may be excluded. In the course of the investigation 936 freshly collected coconuts from three estates were used.

656. CLEARE, L. D., AND SQUIRE, F. A. 634.61 : 2.78  
**The coconut caterpillar (*Brassolis sophorae* L.).**  
*Agric. J. Brit. Guiana, 1934, 5 : 166-99, bibl. 25.*

A very complete, well illustrated study of this pest.

657. NIXON, R. W. 634.62  
**The Dairee date, a promising Mesopotamian variety for testing in the southwest.**  
*Circ. U.S. Dep. Agric., 300, 1934, pp. 12.*

A detailed description is given of a date variety which has proved very much more successful when grown under good cultural conditions and the relatively humid conditions of the ripening season which obtain in the Coachella valley of California than in Iraq, its country of origin. It is suggested that it may well prove successful also under conditions of heavy soil with ground water near the surface, combined with the prevalence of high humidity and frequent dews during the ripening season, such as are to be found in the Colorado river valley.

658. THOMPSON, A. 634.668-2.411  
**A disease of the durian tree.**  
*Malay. agric. J., 1934, 22 : 369-71.*

A disease similar to claret-coloured bark canker of rubber has appeared on the durian in Penang on an estate where this tree is grown in quantity. The causal fungus is *Phytophthora palmivora*. There is a danger of its spread from durian trees to rubber trees and vice-versa and it is pointed out that the presence of an infectious and fatal disease among tree crops which take long to reach maturity is a matter of concern. The only feasible remedy is excision of the diseased bark which is difficult, if the disease is far advanced. The wood should be painted with a weak solution of disinfectant, e.g. 2 per cent. Izal, and covered with tar, melted asphalt (60 parts) and kerosene oil or solar oil 40 parts.

659. ALLEN, O. N., AND OTHERS. 634.774-1.57  
**Decomposition of pineapple trash by bacteria and fungi.**  
*Trop. Agriculture, 1934, 11 : 285-92, bibl. 30, being Tech. Paper 76 of Pineapple Experiment Station, Hawaii.*

Two experiments are described in which the decomposition of entire pineapple stumps, coarsely cut and finely cut stumps, and coarsely cut and finely cut leaves in soil, was analysed by chemical and microbiological methods. The results were not sufficiently conclusive to warrant recommending any one index of decomposition. The greatest loss in the decomposition of the stumps was in sugars, starches and cellulose. In the leaves the greatest loss was in sugars. The largest amount of carbon dioxide resulted from the soil containing coarsely cut stumps followed by those from soils containing finely chopped stumps, coarsely cut leaves and finely chopped leaves. Appreciable differences in amounts of ammonia nitrogen in soils containing various constituents

of the trash were not shown. Marked differences appeared in nitrate nitrogen values of the various soils, that with coarsely cut leaves showing the greatest average amount. The other soils showed less nitrate nitrogen than the controls, it being almost negligible in the case of finely chopped leaves and finely chopped stumps. The stumps had a greater stimulating effect upon the numbers of micro-organisms than did the leaves. [From authors' summary.]

660. SAVAGE, C. G., AND BARNETT, G. B. 634.774-1.589

**Paper mulch for pineapples.**

*Agric. Gaz. N.S.W.*, 1934, 45 : 335-6.

A report of trials at Grafton Experiment Farm 1930-33. The benefit of the paper mulch became very apparent during the dry season as it kept the soil moist and enabled the plants to use the richer top layer of soil. The paper mulched plants flowered and matured their fruit two or three weeks earlier, were more productive, and had larger and better quality fruits than the controls. Only occasional hard weeding was necessary with mulched plants as against frequent cultivation for the unmulched. The paper should last several seasons and with annuals can be taken up and stored till required again.

661. MAGISTAD, O. C., AND OTHERS. 634.774-1.874

**A comparison of legume intercycle crops for pineapples.**

*J. Amer. Soc. Agron.*, 1934, 26 : 372-80, bibl. 8.

The experiment was made at the Wahiawa sub-station of the Association of Hawaiian Pineapple Canners under conditions of low summer rainfall, the layout being a latin square with 36 plots. The soil was acid, pH value 4.9, and was very low in available phosphorus. The plants tested were *Cajanus Cajan*, *Crotalaria juncea*, *C. spectabilis*, *C. anagyroides*, *Stizolobium utile* and *Cassia tora*. All seed except that of *Cassia tora*, which Allen and Allen have shown not to bear nodules or symbiotic micro-organisms, received an ample inoculum of nodule-forming bacteria before planting. The yield in wet weight and the nitrogen content were determined 91 days after planting and again after 157 days. It was found after 91 days that velvet beans (*S. utile*) had produced the greatest yield, i.e. 8,511 lb. per acre on the wet basis, the next highest being 7,006 lb. by *C. juncea*, though as regards dry weights the latter significantly outyielded the others. After 157 days *S. utile* contained considerably more dry weight than after 91 days and its yield on the dry basis was significantly greater than that of the other plants except *C. anagyroides*. The growth of *Cassia tora* was very poor throughout owing to its inability to fix nitrogen. As regards nitrogen content *C. juncea* led after 91 days followed by *S. utile*. After 157 days these positions were reversed. Details of weights and nitrogen content are given for all.

662. MAGISTAD, O. C., AND FARDEN, A. C. 634.774 : 581.084.2

**Experimental error in field experiments with pineapples.**

*J. Amer. Soc. Agron.*, 1934, 26 : 631-44, bibl. 4.

This paper describes uniformity trials on pineapples, each located in a different region, in order to study soil variation. Standard errors for various sizes and shapes of plots are calculated, and in all cases these decreased with increase in plot size. With eight replications, and plots one bed wide and seventy-five feet long, a 5% yield increase was significant. It is recommended that plots three beds wide be used, harvesting the central bed only. Field variation between plants is studied by harvesting a hundred fruits from the two inside rows of a plot. Results and past experiments are presented, showing that throughout the territory of Hawaii the fields have about the same degree of uniformity. The use of randomized blocks and latin squares is discussed in connection with pineapple plots. J.L.E.

663. BURNETT, F., AND FOLLETT-SMITH, R. R. 634.771/3

**Bananas in British Guiana.**

*Agric. J. Brit. Guiana*, 1934, 5 : 148-65.

It is recognized that the establishment of a banana industry in British Guiana would bring great benefit to the colony. The problem is reviewed under the following heads. A. Results of

past investigations and recommendations. The subject has been a matter of controversy for years. Committees and commissions have recommended the encouragement of banana extension and on one occasion a substantial sum was voted for the purpose in the colony's estimates but was not expended. Difficulties to be faced were the unfavourable opinion of the United Fruit Company without whose assistance the project could not hope to succeed, and the danger of a young industry being wiped out in its early stages by Panama disease, which though now absent would surely appear owing to the necessity of introducing Gros Michel suckers from abroad.

B. Results of present investigations and recommendations. In 1933 two representatives of the United Fruit Company again examined the prospects and reported unfavourably on the grounds of unsuitable soil for commercial production of high quality fruit, liability to rapid spread of Panama disease on the acid soils of the country, and probable high cost of transport facilities.

C. Future prospects and recommendations. Larger quantities of Gros Michel for local consumption should be grown and proved suckers will as before be supplied to farmers by the Department of Agriculture. Five and 10-acre blocks will be established to study the economics of cultivation in different districts and soils. When sufficient supplies of good quality fruit are regularly available, the United Fruit Company have stated that they will enter the market as potential buyers.

D. Hints on cultivation are given. In summing up the authors express their opinion that the experiments now being carried out should be valuable in allowing a correct judgment of the possibilities to be reached.

664. CHEESMAN, E. E.

634.771/3-1.523

**Principles of banana breeding.***Trop. Agriculture*, 1934, 11 : 132-7, 176-81, 203-9, bibl. 66.

The chief problem involved in the West Indies is to breed a new banana which will combine all the good qualities of the existing Gros Michel variety with resistance to Panama disease. The need is urged for a comprehensive collection of the sub-genus *Eumusa* containing some 20 species, from which group all the edible varieties of banana appear to be derived. The Imperial College of Tropical Agriculture has 9 or 10 species of which 4 have figured in the breeding period under review. The confusion in nomenclature is very great, the number of varietal names in use running into several thousand. It is suggested that the only way to cope with this is to make a careful comparison of varieties in each banana growing country and to reduce the names to a single set of standards to be applied in all local scientific work, and secondly by the comparison of local standards from different countries on a central station which can define and maintain type specimens in a living condition. Applying these principles to the varieties under observation at the I.C.T.A. the number labels have been reduced from 88 to 50 made up as follows:—Clones recognized as distinct and used as standards 25; sub-types and duplicates 5; still under comparison with standards 17; still under preliminary observation 3. The final product of banana breeding must be a sterile plant and it has been found that most of the sterile varieties under observation are triploids. The most promising seedlings are tetraploids and they exhibit greater fertility than their triploid parents. It is suggested that it may be possible to restore triploid conditions at will, for instance, by crossing a tetraploid with a diploid, and if this should prove to be the case the breeder might work through the intervening stages with the tetraploids, assisted by their greater fertility, reintroducing the triploid condition at the final stage. Tetraploids, however, may of themselves produce the sought for variety. The pollinations to date are discussed and the results of some of the crosses are described. The main lines of future investigation are outlined thus:—(1) *Intercrossing diploids* is practically species crossing but the sterile diploids have a possible use in elucidating relationships. (2) *Crossing triploids by diploids* is unprofitable but desirable (a) to complete the analysis of standard clones, (b) to obtain more tetraploids for further breeding, (c) to continue the attempts to raise a commercial tetraploid especially from Gros Michel. (3) *Crossing diploids with tetraploids* offers great possibilities and is largely unworked. (4) *Intercrossing tetraploids* is with one exception an unworked line. Its possibilities are that it affords the means of combining in one plant characters from two triploids which cannot be crossed directly, and the chance that two partly fertile tetraploids might combine to give a completely sterile offspring, which the author considers would be a long step forward.

665. LARTER, L. N. H. 634.771/3 : 575.252

**Sports of the Gros Michel.**

*J. Jamaica agric. Soc.*, 1934, 38 : 461-5.

Six sub-varieties of the Gros Michel banana originating during the last decade in Jamaica are described. All are susceptible to Panama disease and generally commercially inferior to the parent variety, but one or two are superior in some other respects, i.e. in fertility, which may be useful from the breeding standpoint. The fact that these variations can occur leads the author to express the hope that a type resistant to Panama disease may one day appear in this manner.

666. WARDLAW, C. W. 634.771 : 632.3/4

**Banana diseases. VIII. Notes on various diseases occurring in Trinidad.**

*Trop. Agriculture*, 1934, 11 : 143-9, bibl. 17.

The following diseases are discussed. Bacterial wilt disease—bacterial disease of Cavendish fruits—Panama disease affecting different varieties—heart leaf rot—virus diseases—fruit spots—the aphid *Pentalonia nigronervosa* Coq. with its parasitic fungus *Cephalosporium crassum* Patch.

667. WARDLAW, C. W. 632.48 : 634.771/3

**Banana diseases. IX. The occurrence of sigatoka disease (*Cercospora Musae* Zimm.) on bananas in Trinidad.**

*Trop. Agriculture*, 1934, 11 : 173-5, bibl. 14.

The disease, which has not previously been recorded in the Western Tropics, is described and control measures are discussed.

668. STAHEL, G. 632.48 : 634.771/3

**The banana leaf disease in Surinam.**

*Trop. Agriculture*, 1934, 11 : 138-42.

The disease is shown to be due to the fungi *Helminthosporium torulosum* and *Cordana Musae*.

The following also are noted:—

MURRAY, R. K. S. **Ceylon clones II.** *Rubber Research Scheme Ceylon*, 1st quart. circ. for 1934, pp. 3-16. The second of a series of annual reports on Ceylon clones.

MURRAY, R. K. S. **Oidium leaf disease in Ceylon in 1934.** *Rubber Research Scheme Ceylon*, 2nd quart. circ. for 1934, pp. 36-42, bibl. 6.

MURRAY, R. K. S. **The sulphur dusting treatment for Oidium**, *ibid.*, pp. 43-53, bibl. 5.

LAMBOURNE, J. **Studies in Malayan soils. Part IV. Experiments on the conditioning of an infertile soil.** *Malay. agric. J.*, 1934, 22 : 4-24. [Parts I, II and III appeared *ibid.* 21 : 347-61, 471-91 and 22 : 4-24.]

JULIANO, J. B. **Studies on the morphology of the Meliaceae. I Sandoricum Koetjape** (Burm. f.) Merrill. *Philipp. Agric.*, 1934, 23 : 11-35, bibl. 25. II Sterility in santol, **Sandoricum Koetjape** (Burm. f.) Merrill, *ibid.*, 253-62, bibl. 13.

OCFEMIA, G. O. **Bud rot of coconut.** *Philipp. Agric.*, 1934, 23 : 4-10, bibl. 6. The article appears to break no new ground.

STICKNEY, F. S. **The external anatomy of the red date scale, *Phoenicococcus Marlatti* Cockerell, and its allies.** *Tech. Bull. U.S. Dept. Agric.*, 404, 1934, pp. 162, bibl. 16.

MAGEE, C. J. **Squirter disease of bananas.** *Agric. Gaz. N.S.W.*, 1934, 45 : 262-4. [A full abstract on the squirter disease of bananas will be found in *H.A.*, 1934, 3 : 4 : 581.—ED.]

BARNETT, G. B. **The selection and treatment of banana plants.** *J. Dept. Agric. W. Aust.*, 1934, 11 : 423-7.

COLLINS, W. E. **The growing of sweet potatoes.** *J. Dept. Agric. W. Aust.*, 1934, 11 : 482-5.

## STORAGE.

669. DUSTMAN, R. B. 664.85.11 : 547.313.2 + 535.21  
**Effect of ethylene, ethylene chlorohydrin and ultra-violet light on carbohydrate content of stored apples.**

*Plant. Physiol.*, 1934, 9 : 637-43, bibl. 12.

Comparable samples of stored Stayman Winesap, Rome Beauty and Ben Davis apples were submitted for 1½ to 2 hours on 35 days out of 41 to the following treatments :— ethylene 1 to 1,000 by volume ; ethylene chlorohydrin 1 cc. of 40 per cent. solution per bottle (allowed to evaporate) ; irradiation with a universal model Hanovia mercury arc lamp for 60 minutes (30 minutes on each side) at 30 cm. distance. They remained in store between treatments and were analysed at the end of the period. None of the treatments materially affected the chemical composition of the fruit nor the pH of the expressed juices. Ethylene treatment did, however, hasten the colour change from green to yellow and the softening of the apple tissues.

670. KESSLER, H., AND RHINER, O. 664.85.11  
**Erfahrungen bei der Einlagerung von Äpfeln im Felsenkeller von Berneck. (Apple storage in natural caves at Berneck in the Canton of St. Gallen.)** [French summary.]

Reprint *Landw. Jb. Schweiz.*, 1934, pp. 225-39.

Considerable success was achieved in this natural cave, especially when storage was carried out in 20 to 30 kg. cases and impregnated wrappers were used for apples having a pronounced tendency to shrivel such as Belle de Boskoop. The advantage over an ordinary house store is that the temperature drops more rapidly in early winter, keeps constant between 2° and 4° C. during the winter and only slowly rises in the spring.

671. SOLIANIKOFF, P. 664.85.11/13  
**The prevention of loss of fruit during handling. The disadvantages of piling fruit prior to storing.** [Russian-English summary.]

*Publ. Crimean Zonal Exp. Sta. for Tree and Bush Fruits*, 1934, pp. 80, bibl. 41.

The common Crimean practice of piling apples and pears in heaps on the ground for 6 to 20 days after picking before storing was tested against immediate storage. The fruit stored immediately either in ordinary or in cold store proved to offer a better appearance and to have a longer storage life than that piled with the exception of fruits picked when very small and immature. [From author's summary.]

672. ESTRADA, M. 634.13 : 382.6  
**Factores tecnicos de la exportacion de peras. (Technical factors in the export of pears.)**

*Rev. B.A.P.*, 1934, 17 : 204 : 21-30.

With a view to placing the export of pears from the Argentine on a sound commercial basis an enquiry has been instituted into the methods employed in other countries. This paper is a report on the technical aspect, and includes methods of cold storage, the use of the pressure tester for ascertaining the necessary degrees of maturity at harvest, which vary with the variety and the destination of the fruit, and the reduction of export pears to a few important varieties.

673. CLAGUE, J. A., AND FELLERS, C. R. 664.85.76 : 581.192  
**Relation of benzoic acid content and other constituents of cranberries to keeping quality.**

*Plant Physiol.*, 1934, 9 : 631-6, bibl. 19.

A large percentage of varieties which showed poor keeping qualities had a low total acid content and most of the good keeping varieties had a high total acid value. But the fact that some varieties showed very good keeping qualities without a correspondingly high benzoic acid content indicates that other factors, probably physical or environmental, are more important than benzoic acid content alone in determining the keeping properties of the cranberry.

674. TRAETTA-MOSCA, F., AND VENEZIA, M. 664.85.63  
 Sulla conservazione delle olive. Nota seconda. (Olive preservation. Second note.)  
*Ann. Ist. sup. agr. Portici*, 1933, 6 (ser. III) : 24-30, bibl. 3.  
 The authors have examined methods of preserving olives between the time of harvesting and that of oil extraction. Different treatments were given for 20, 40, 60 and 80 days, after which the organoleptic qualities of the treated and the control olives—tested at the outset—were determined. The preservative media, all in closed vessels, were distilled water, ordinary drinking water, sea water, sodium chloride (40 gr. per litre), sulphur dioxide (0.2 gr. per litre) sulphur dioxide (0.4 gr. per litre), and sulphur dioxide (0.6 gr. per litre). All were successful in preserving olives in an excellent state for oil extraction as shown by taste and chemical analysis. It is thought that the absence of air and the consequent unimpaired state of the wall of the fruit were the principal factors in success.

675. WARDLAW, C. W., AND OTHERS. 664.85 + 664.84  
 Observations on the storage of various fruits and vegetables.  
 Reprint *Trop. Agriculture*, 1934, 11 : 196-200, 230-5, bibl. 5.  
**Tomatoes.** Storage took place at 45° F. and 50° F. Manuring within normal limits was found not to affect storage life of the Bonnie Best variety provided the fruit was picked green and was free from damage. The time at which the fruit was picked within a period of 5 to 6 weeks did not affect its keeping qualities. Wastage, due primarily to *Phoma destructiva*, was kept in check at 45° and 50° F. and the tomatoes successfully passed through a storage life of 20 days at these temperatures followed by 5 days ripening at 70° F. before serious fungal wastage occurred. Short progress notes are given on the storage of *cauliflowers*, *string beans* and *egg plants*.  
**Cucumbers.** Small, medium and large sized cucumbers were stored at 45° F., 50° F. and 60° F. for periods up to 40 days at a humidity of 80 to 85%. Excellent condition was preserved for 20 to 25 days by storage at 50° F. After this the fruits, especially the larger ones, began to yellow and develop a bitter flavour. Wastage occurring at this stage was due mainly to, *Colletotrichum lagenarium*, *Fusarium* spp., *Mycosphaerella citrullina*, *Cladosporium cucumerinum*, *Macrosporium cucumerinum*. Trials with muskmelons were not very successful. **Papaws.** Experiments here are of a preliminary nature and so far only a few general conclusions would appear to be warranted. Before experiments can be of use the production of suitable standard varieties is essential. Fruit reaped when already yellow but still quite firm and stored at 45° F. appears to give the best chance of successful export. Such fruits properly packed have been kept successfully for 20 days in storage. Wastage at higher temperature was due to *Gloeosporium* spp., *Fusarium* spp., *Phomopsis Papaya* and others. **Pineapples.** The difficulty here lies in the occurrence of physiological breakdown at low temperature. Storage for 15 days at 60° F. resulted in over-ripeness. After 11 days at 60° a good proportion were ripe and juicy but the ripening was somewhat uneven. At 50° F. at the end of 11 days some fruits had ripened and were of good flavour, but distinctly more acid than those stored at 60° F., while after 15 days all fruits were ripe and of good flavour but of an abnormal dark green colour. Investigations are being continued. **Granadillas.** Fair success attended storing green fruits and those just turning yellow at 45° F. for 15 days and subsequently ripening at 70° F. for 7 to 10 days. **Grapefruit.** Depreciation in shipments is attributable to wastage due to fungi and to decrease in moisture content. Details are given here of observations made of the effect of a number of different commercial treatments on keeping quality and wastage. Samples of 100 Marsh grapefruits treated as follows were held at 45° F. and 50° F. respectively :—(1) Washed and waxed, (2) washed only, (3) coloured and washed, (4) borax solution, coloured and washed, (5) coloured, washed and waxed. Waxing consists in running fruits through a proprietary solution in which wax in a paraffin base is emulsified in water while colouring is done by ethylene gas. The resultant losses of weight are tabulated. **Oranges.** Comparative tests were made of storing the King Orange or Giant Mandarin (*Citrus nobilis* sp.) and a collection of orange varieties including Valencia, Navel, Pineapple, Lamb's Summer and Jaffa at 45° F. and 50° F. After

**STORAGE.****PACKING, PROCESSING.****VEGETABLES.****WRAPPING—CITRUS—PEACH.**

50 days in cold store most of the oranges in all cases were still in good condition. Those King Oranges, however, which had entered the store quite ripe had lost their flavour at both temperatures. Less ripened fruits were not so affected.

676. PLATENIUS, H., AND OTHERS.

664.84.037

**Studies on cold storage of vegetables.***Bull. Cornell. agric. Exp. Sta.*, 602, 1934, pp. 24, bibl. 11.

This is a preliminary report on 3 years' experiments at Ithaca. The authors deal briefly with the chief factors which affect cold storage, namely transpiration, respiration, chemical changes, and breakdown both physiological and parasitic. They then discuss their results to date with the following vegetables:—asparagus, snap beans, lima beans, sprouting broccoli, beets, brussels sprouts, cabbage, carrots, cauliflower, celery, cucumbers, eggplants, kale, lettuce, muskmelons, onions, parsnips, peas, peppers, pumpkins, rutabagas, squashes, sweet corn, tomatoes. Chemical changes are found to be responsible for the rapid lowering of eating quality of vegetables such as sweet corn, asparagus and peas which owe their taste largely to a high sugar content, and although the loss of sugar can be considerably retarded by exposing to a temperature of 32° F., their storage life is very short. Wilting, which causes deterioration of most of the leafy vegetables and root crops can be delayed by the maintenance of high humidity.

**PACKING, PROCESSING AND FRUIT PRODUCTS.\***

677. ANON.

664.85.021

**Fruit wrapping.***Calif. Citrogr.*, 1934, 19 : 343.

Reference is made to a new fruit wrapping substance known as Pliofilm which is under trial in Arizona. The material is thin and looks like cellophane but is very tough and elastic. It will stretch to several times its own length and is impervious to air or moisture. Grapefruit wrapped in it lost only 4% in weight in 6 weeks and were plump and firm while the controls lost a third of their weight and were leathery and unpalatable.

678. PUTTERILL, V. A.

664.85.3 : 632.1/4

**Citrus wastage investigations.***Bull. Dept. Agric. S. Afr.*, 131, 1934, pp. 40.

Data obtained from tests carried out at Grahamstown and Zebediela in 1933 in continuation of those made at Zebediela in 1931 and 1932 are here given and discussed. One of the chief problems is how to overcome the dangers to fruit inherent in a system whereby oranges have to stand long haulage in field boxes over very bad roads before packing. Experiments have, therefore, been concerned chiefly with packing, e.g. time of packing whether immediately after picking or not, packing materials including boxes and padding where used, method of packing and whether loose or light. The results are mere indications which will enable the 1933 experiments to be modified, repeated and widened in future years.

679. KERTESZ, Z. I.

577.15 : 634.25

**The oxidase system of a non-browning yellow peach.***Tech. Bull. N.Y. St. agric. Exp. Sta.*, 219, 1933, pp. 14, bibl. 13.

It was found on testing different yellow peach varieties for preserving purposes that the Sunbeam variety (Arp x Slappey) showed much less browning in its slices and juice on standing in air than did most varieties. This is a distinct advantage. Analysis showed that its oxidizing enzymes do not differ from those of other peaches, but that there is in it a very marked deficiency, probably an absence, of catechol tannin compounds. When these compounds were extracted from varieties which show browning and were added to the enzyme prepared from Sunbeam peaches, the oxidizing system functioned in the usual way and browning occurred.

\* See also 514, 693, 694.

680. ANON. 664.85.047

**Pineapple juice prevents discoloration of cut fruits.**

*Citrus Ind.*, 1934, 15 : 9 : 9.

An outline of the recent discovery by Balls and Hale of U.S.A. Bureau of Chemistry and Soils, that sliced apples and other fruits for sale dried can be prevented from turning brown by spraying them with pineapple juice immediately they are cut. The juice is a by-product of canning factories. After spraying a thin film of dry residue is left on the fruit. This can be avoided by first fermenting the juice, removing the yeast and alcohol and using the purified juice as a spray. The alcohol recovered is said to more than pay for the process. Cut dried apples submitted to this process have remained white for many months. The usual method of stopping browning is to treat the fruit with sulphur dioxide which is unpleasant to many, while brown untreated fruit is unacceptable on the market.

681. VENEZIA, M. 634.63-1.547.6 : 665.327.3

**Sulla qualità degli olii in rapporto alla maturazione delle ulive. (The quality of olive oil as affected by ripeness of fruit.)**

*Ann. Ist. sup. agr. Portici*, 1934, 6 (ser. III) : 31-6, bibl. 18.

Experiments with the Rotondelle variety confirm the opinion that ripening actually favours an increase in oil content and that the composition of oils extracted during 5 distinct epochs of ripening, judged by the most significant constants, is not modified sufficiently to affect quality. [Author's summary.] The experiments are being continued to establish the exact nature of the changes which do occur.

682. JOSLYN, M. A., AND MARSH, G. L. 663.815.2/7

**Some factors involved in the preservation of orange juice by canning.**

*Fruit Prod. J.*, 1934, 14 : 45-9, 56.

(1) The deterioration of canned orange juice which is partly enzymatic in nature can be markedly reduced by suitable heat treatment. Overheating, however, easily induces cooked flavours. (2) De-aeration at least of the juice extracted by bursting improves the quality of the juice. (3) To destroy the pectic enzymes involved in clearing and clumping the juice must be heated for 2 minutes at 87½° C. or 8 minutes at 85° C. (4) Variety, locality, maturity and quality of fruit markedly affect the flavour and keeping quality of the juice. (5) Irradiation with ultra violet light introduces off flavours and in no way improves the juice. (6) Freshly canned orange juice irrespective of the process is satisfactory but deteriorates in quality during storage, the rate of deterioration varies with the process and with storage temperature. Cold storage is recommended. (7) Juice packed in enamel cans is superior in flavour to juice packed in tin cans. [From authors' summary.]

683. LAMB, J. 663.95 : 633.72

**Tea tasters' terms.**

*Tea Quart.*, 1934, 7 : 129-33.

A glossary of tea tasters' terms, to which is joined a plea that tasters should use standardized expressions which will convey their exact meaning, a matter of considerable importance in describing teas. Attempts to vary monotony or to express originality by using different terms to convey the same idea are only confusing and leave the manufacturer in doubt as to whether he is maintaining an even standard.

684. KNAPE, A. W. 633.74 : 663.913

**Cacao fermentation in West Africa.**

*Bull. imp. Inst. Lond.*, 1934, 32 : 411-28 ; reprinted from *J. Soc. chem. Ind. Lond.*, 1934, 53, 151T-8T.

The plantations on the Gold Coast are native owned and managed. The methods of carrying out fermentation though influenced by the price obtained and by the advice of the Department

of Agriculture are of the simplest nature. There are six' different arrangements for conducting the fermentation. (a) The heap. The beans are heaped in a conical mound on plantain leaves on level ground, covered with the same material and left thus for 6 days. Theoretically they should be turned every two days but this is often neglected. The size of the heap varies from 6 ft. to 2 ft. in diameter. (b) The pit. The pits are small basin shaped holes 2 ft. deep and 3 to 4 ft. in diameter lined with plantain leaves. The method is slower and inferior to (a) owing to lack of drainage and aeration. (c) Wooden boxes. A system of boxes 3 ft. by 6 ft. arranged in steps. The beans are turned from an upper box to the one beneath every second day (perhaps). (d) Baskets. Circular baskets 2 ft. 3 in. in diameter and 1 ft. 7 in. high holding 274 lb. of wet cacao. The cacao is supposed to be thoroughly mixed every third day. (e) Frames of plantain stems. The frame has no top or bottom though occasionally a light roof is provided. It is lined with plantain leaves and holds a compact mass of beans 1-2 ft. high. It is stirred once by treading on the third day. (f) Large raised bamboo frames having a floor area 10 ft. by 10 ft. raised 1 or 2 ft. from the ground, the flooring consisting of split bamboo mats. The beans are mixed on the third day. Some of these frames yield a ton of dry cacao at a time. The author conducted and describes a series of experiments and investigations on these methods from which he concluded:—that the best type of container is the wooden box though it often has insufficient protection against cooling; that a considerable improvement in quality could be obtained if the cacao, whether in heaps or in boxes, could be thoroughly and quickly mixed every two days; that the quantities of cacao fermented at a time are often too small; that picking should be more frequent and careful, but that, as this would tend to reduce the size of the heaps still further, the solution is for a number of farmers to join in a communal fermentary as is done sometimes in Nigeria.

685. JOACHIM, A. W. R.  
The curing of ginger.  
*Trop. Agriculturist*, 1934, 83 : 212-6.

633.825-1.56

Of the two methods of curing ginger (1) sulphur curing, (2) ordinary curing, the former, which had a number of advantages over ordinary curing, has now to be discontinued owing to the regulations introduced in most importing countries prohibiting the sale of ginger containing sulphur dioxide. An investigation was made by the Department of Agriculture, Ceylon, to discover whether equally good samples of ginger could be prepared without the use of sulphur. The most suitable variety was found to be the Cochin, which if cured in the proper way gives a plump light buff coloured product of good aroma, flavour and fracture. A period of eight to ten days of sunshine is essential for curing. If rain falls on the ginger during this period, mould and a musty flavour are developed which no amount of washing and drying will eliminate. To obtain a light coloured product curing should begin as soon as the crop is harvested. If more than is required for a day's peeling has to be harvested, the rhizomes should be placed in a well-aired room in small heaps, dry soil being spread over successive layers of ginger. As soon as harvested the ginger is first washed to remove all earth and then soaked in clean water till the following morning. Peeling is the next operation and this may be either rough peeling for the local market or clean peeling for the English market. Clean peeling is expensive and only 10-14 lb. per day can be cleaned by one peeler. As soon as peeled the rhizomes are placed in water and the gummy exudation removed by washing. Several more washings and soakings are given, as this is one of the most important operations in ginger curing. When washing is complete the ginger is spread on cement or bamboo tables to dry, rock slabs being better still. Drying takes 5 or 6 days, during which time the ginger must be turned several times daily. When quite dry the ginger is washed again, a process which improves the colour considerably. This washing is only used with clean peeled ginger for the foreign market. The final drying takes 3-4 days. Crude peeled ginger in India is sometimes soaked in a mixture of red earth and whitewash and then dried. This prevents the growth of mould. A newly devised ginger peeling knife is illustrated.

686. BAUER, W. 634.873  
*Foreign production, trade and government aid in the raisin and currant industry.*

*Bull. Calif. agric. Exp. Sta.*, 566, 1933, pp. 142, bibl. 133 special + 36 general.  
The object of the study recorded here was primarily to discover the methods employed by the governments of various countries to promote the raisin and currant industries in their particular lands and the results of such action, with special reference to their effect on the Californian product. Detailed statistics are given of the production of these two commodities in the chief countries concerned and of the exports and imports during the last 30 to 40 years. The following are dealt with separately:—The currant industries in Greece, Union of S. Africa, and Australia, and the raisin industry in Greece, Smyrna, Cyprus, Palestine, Transjordania and Syria, Italy, Spain, Persia, Russia, Australia, Chile, Argentine. The different measures adopted form an interesting economic study. As regards actual production, figures for 1926-30 show that during this period Greece produced over 90% of the currants, followed by Australia with 9.5%. Of the raisins California produced nearly 55%, Australia 10%, Smyrna nearly 11%, Russia 5.6%, Spain, Persia and Greece between 4 and 5% each.

687. LEVIE, E. L. 634.441  
*Onderzoeken naar den handel in magga's in de omgeving van Cheribon en Pasoeroeaan. (The marketing of mangoes in Cheribon and Pasoeroeaan, Java.)* [English summary.]  
*Landbouw*, 1934, 9 : 545-55.

An investigation by the Division of Horticulture, Java, into the marketing of mangoes in two important centres is reported. It would appear that the profits chiefly remain with the salesman and middleman. Suggestions made for improving the situation are, (a) that the farmer should be given access to cheap credit and that the present method of obtaining credit from the big traders should be abolished, (b) that the mango should be marketed through co-operative or philanthropic societies instead of through the wholesaler, (c) that steps should be taken to diminish the risks inherent in the fruit trade. Suggestions (a) and (c) could operate at short notice. A cheap method of keeping tropical fruits a few days longer than is now possible would be of assistance in these schemes.

#### NOTES ON BOOKS AND REPORTS.

688. BEZEMER, T. J. 41.3 - 2 - 3 = 39.3 - 4  
*Dictionary of terms, relating to agriculture, horticulture, forestry, cattle breeding, dairy industry and apiculture in English, French, German and Dutch.*

George Allen & Unwin Ltd., London, 1934, 8vo, pp. 248, 25/-.

The only real test of such a dictionary is its constant use. Since, however, the very recent publication of this work precludes such a test, recourse must be had to quicker though less reliable methods of evaluation. Is it comprehensive and is it reasonably accurate, and how does it compare with other dictionaries in this respect? As regards comprehensiveness the editor admits in his preface that he has been forced to make selection of the words to be used. Thus he states that not all injurious and useful insects are included, but only those which are most important to agriculture. The difficulty of deciding border line cases is obviously immense and results of such decision cannot satisfy everyone. Moreover, he points out, being the first dictionary in the field to deal specifically with agriculture, it obviously cannot make any claim to completeness, and suggestions are invited as to sins of omission and commission. Further the work does not pretend to be an encyclopaedia. It is not a defining or a descriptive dictionary, and, as is noted by the editor, the reader is assumed to be aware of the meanings of words in his own language. That there are indeed somewhat serious omissions soon becomes apparent. May we win the editor's gratitude by suggesting a few? Abscission, crab apple and crab stock,

banana and tropical horticultural crops in general, capsid, carbolineum and winter wash, catalase, citrus, cover crop, dewberry, die back, ditcher, dusting in sense of dry spraying, fig, fireblight, free stock, hedger, iodine, labourer, layout, leaf scorch, loganberry, mulch and sod mulch, pecan, persimmon, pistache, ploughman, plot, pyrethrum, rootstock, sport, smudging, stoolbed, trowel, vernalization, viticulture. Here it should be noted that in one case at least the foreign equivalent is given but with a curious English translation. Thus the foreign equivalent of rootstock appears as unterlage, sujet and onderlaag, but the English version is given as parent stock, wildling and wild stock, which is an inaccurate and inadequate translation. Next may we suggest that the following terms are perhaps somewhat precious? Though understandable by the aid of mother wit or of the Oxford dictionary they leave us irritated even if enlightened:—basic slacks, gladiole, inflorescence, ligh-trequirement, nursery man, assart, assayer, period for wich . . . , sabulous, agricultural university, infectuous abortion, parturition, polnish wheat, viniculture.

The editor asks for comments. May we take this to mean that he contemplates a second edition at no distant date? The idea is excellent. We believe that horticulturists from all parts of the globe are just ready for such a dictionary, provided it is comprehensive and accurate. Let them be approached forthwith to remedy sins of omission and commission. And now in our enthusiasm broaching the subject of a second edition may we point to the serious research work being carried out in Italy and her colonies and in Spain and Spanish speaking countries of South America and urge the inclusion of these two further languages. Lastly, we insist that poetic licences are not granted to lexicographers and that in a dictionary of this nature, to be used by English and American horticulturists, plain English is preferable to rarities and solecisms. To ensure the elimination of these the manuscript of the revised version should before going to press be submitted to the close scrutiny of an Englishman of some agricultural knowledge and general education.

What then are the merits of the first edition of this dictionary, with which, after all, we are here concerned? It is well printed, of small size (approx. 6" x 8 $\frac{1}{2}$ " x 2") and weighs about 2 $\frac{3}{4}$  lb. It thus compares very favourably with any one dictionary from German, French or Dutch giving even approximately the same information. It contains, moreover, a large number of expressions which will not be found in many much larger, ordinary foreign dictionaries: green manuring, damping off, bitter pit, the different types of grafting such as cleft, crown, root, top, whip graft etc., bordeaux mixture, glassiness in apple, silver leaf may serve as examples. Such expressions appear in the English section with their foreign equivalents and in their proper place in the foreign sections, and their inclusion is most valuable.

Taken then in its entirety this work, though not the very perfect horticultural dictionary for which we have sighed so long, is definitely the nearest approach as yet to that ideal. As such, despite its shortcomings, it can be warmly recommended to the studious horticulturist.

#### 689. SECRETAIN, C.

#### *Le murier. (The mulberry.)*

Maulde et Renou, Paris, 2<sup>me</sup> édit., 1934, pp. 99, bibl. 48 pages.

634.38

The author is director of the sericultural station of Alès, Gard. He does not pretend to offer a complete guide on mulberry growing, but merely gives a general idea of what rational cultivation methods are without essaying to solve the particular problems which may face individual growers. A few notes are given on the black mulberry, *Morus nigra*, but the author is chiefly concerned here with the now more usually grown species *M. alba*, and he describes the leaf characters and soil and cultivation requirements of some 8 varieties or sub-varieties of this species. Systems of growing include large trees (5 to 10 m. apart according to soil), small bushes (2 to 4 m. apart) and cordons (1.5 m. apart in the rows and 2 m. between rows). Analysis shows the leaves of the bush or cordon type to have a superior nutrient content to that of standard trees. Pruning is discussed and the more important pests and diseases. For those wishing to make a detailed study of any particular phase of mulberry growing the bibliography should be invaluable. It forms about half the publication and is divided into the following sections, in each of which the references are arranged chronologically:—Works of general interest dealing with the mulberry—

Mulberries and silkworms—Varieties—Training—Economics of growing—Pruning—Grafting—Propagation—Manuring—Mulberry nurseries—Mulberry growing in France—Diseases—Pests—The mulberry leaf—Various uses of the mulberry.

690. BRACCI, F. 634.63 + 665.327.3  
*L'olivo e l'olio. (Olives and olive oil.)*  
 Collana agraria dell' opera nazionale combattenti, Rome, 1934, pp. 219,  
 8 liras.

This small practical manual is primarily addressed to the young Italian olive grower and forms part of an agricultural series of publications which may be compared with the bulletins issued by the Ministry of Agriculture in London in recent years. It is divided into 3 parts, the first dealing with the cultivation of the olive, the 2nd with oil extraction and preservation, and the 3rd, an appendix, with the preparation and choice of table olives. Diagrams in part two add considerably to its value.

691. ITALIA AGRICOLA.\* 634.872  
*Uve da tavola. (Table grapes.)*  
 Ital. agric., 1934, Vol. 71, Number 9, special number devoted to table grapes,  
 pp. 715-911.

It is several years since the last special number on table grapes and during this time considerable progress has been made in Italy towards the establishment of such a rational system of table grape growing as will ensure table grapes both for home and foreign consumption. The progress made is shown here and information of considerable practical importance is given on the following subjects:—International trade in table grapes, the best varieties for the early, ordinary and late market,† and for storage purposes,† progress on breeding table grape varieties, the productions of raisins and the utilization of surplus table grapes, cultivation systems with special reference to training and pruning,† table grapes in relation to the agricultural associations, the nutritive and medicinal properties of the grape.

692. BANE, W. A., AND GETHIN JONES, G. H. 634.1/7-1.4  
*Fruit-growing areas on the Lower Greensand in Kent. A survey of the soils and fruit, 1928-31.*  
 Bull. Minist. Agric. Lond., 80, 1934, pp. 81, bibl. 16, 3/-.

This survey is one of a number made in different fruit-growing areas of the country with the aid of the Fruit Soil Survey Committee of the Ministry of Agriculture, and fulfils a need indicated in 1911 by Hall and Russell in "A Report on the Agriculture and Soils of Kent, Surrey, and Sussex". The bulletin is divided into four parts:—In Part I are described the geology of the district, the process of soil formation and the method of soil surveying employed. The system of soil classification used is based on the American method, in which the soils are grouped into series according to their characteristics and natural properties, as exhibited by their examination in the field. The geology and the positions that the soil series typically occupy are illustrated by a map and a diagrammatic section. Part II deals with the history and present position of fruit-growing in the area and with general pomological investigations. The data on distribution of varieties, rootstocks and incidence of diseases and pests are summarized and tabulated. One of the main functions of the survey was to decide the comparative parts played by soil and climatic and management factors on observed differences of growth. These factors are discussed and illustrative examples described. The results of the correlative work are given in Part III, where the soil series are described and the relation between tree growth and soil conditions discussed for each, reference being made to any preference of kind or variety of fruit. A tabular summary of the chief characters of the soil series and their influence on the growth of fruit trees is given. Conclusions are given in Part IV. Briefly stated they are as follows:—As a whole

\* Obtainable from Italia Agricola, Palazzo Margherita, Via Veneto, Rome.

† Separate abstracts in this issue of *H.A.*, 550, 552-554.—ED.

the Lower Greensand is undoubtedly very fertile for growth of tree and bush fruits. There are, however, some series which are better or worse than most, some of these exceptional soils being widespread and others limited in extent. Soil water conditions are of great importance in this differentiation. The terms "good" and "bad for fruit" cannot be applied to a soil series without qualification while management factors may play an important part in overcoming soil effect. There is a marked preponderance of culinary over high-class dessert varieties in the area, possibly due more to widespread condition of excess nitrogen resulting from the usual manurial practice for hops than to inherent unsuitability of the soils for production of high-class dessert fruit. It is now possible to indicate how the area under fruit can be most profitably extended and the new land planted to the best advantage. Twenty-four photographs illustrate soil profiles and the effect of soil and management factors on tree growth. W.A.B.

## 693. MINISTRY OF AGRICULTURE, LONDON.

634.11-1.564.4

**Apple packing.***Bull. Minist. Agric. Lond.*, 84, 1934, pp. 26, 1/3 net.

In this most practical and useful guide the Ministry has definitely gone gay. Not content with some 30 excellently clear and instructive photographs within, it has embellished its light blue covers with striking symbols in black and red suggestive of uniform boxes full, but not too full, of well wrapped and firmly packed Cox's Orange Pippins. The bulletin contains the information given in a previous report ("Preparation of fruit for market," part I), rewritten and in amplified form. The writer mentions with approval the thinning of fruit and gives a few hints as to times and processes. He then considers at some length the various aspects of picking including time to pick, method of gripping and picking the apple, the use of the best type of ladder, the best type of receptacle for picking into. Next grading and sizing are dealt with, the necessity for culling being stressed and hints being given on the utility and manufacture of home made apparatus. The process of wrapping is urged on the ground that the wrap forms a buffer and if of oil paper prevents the spread of disease. The best form of package is considered in detail and it is suggested that for National Mark Fancy Grade and above non-returnable wooden boxes, of which illustrations are given, should always be used. The different packs are described in detail. Finally in Appendix I and Appendix II the exact specifications for the different grades of National Mark apples and National Mark Standard packages are given.

## 694. REGGIO CALABRIA.

668.52

*Relazione sull'attività svolta nel periodo 1929-33 della R. Staz. sper. per le industrie delle essenze e derivati dagli agrumi. (Report on work of the Royal Exp. Sta. at Reggio Calabria for essential oils and citrus extracts for 1929-33.)*

Reggio Calabria, 1934, pp. 30, bibl. 14.

The research station by its experiments with modern plant has shown how great economy can be effected in the extraction of essential oils from citrus and other plants. Cultivation trials are also in progress on various plants for the perfumery trade such as jasmine, rose, acacia and tuberose, and on herbs grown for their essential oils. These include geranium, mint, salvia, basil, marjoram etc. Only the bare bones are given here, but the bibliography includes a number of references to bulletins issued by members of staff which would appear to deal with particular problems of this very specialized subject.\*

## 695. MANN, H. H.

633.72

**Report on tea cultivation and its development in Nyasaland.**

Published for the Government of Nyasaland by the Crown Agents for the Colonies, London, 1933, pp. 41, 2/6.

The report describes the conditions under which tea is grown in Nyasaland, analyses any defects of the present system and suggests what special measures should be employed to give a maximum of success. The areas studied were Mlanje and Cholo. Climate. The climate of the tea growing districts of Nyasaland bears a close but not complete relationship to that of Northern India.

\* Steps are being taken to get these bulletins for the Bureau library.

*Soil.* The soils are well drained and have the great advantage lacking in many tea countries of an extremely pervious subsoil. Tea roots have great difficulty in penetrating hard or water-logged subsoils, but in this country their root growth is exceptional. The root system of tea is described. The importance of preventing erosion is stressed. The tea plant cannot be expected to adapt its root system when established to the new soil conditions which erosion sets up. The tea soils of Mlanje appear to be of the very highest class except for a deficiency of sulphur and a possible deficiency of phosphates. In Cholo the soils are less rich, green manures should be used from the beginning and artificial manures at an earlier date than in Mlanje. *Treatment of soils.* The following measures should be taken in order to reduce the future expenditure on fertilizers:—Erosion should be prevented by contouring and other mechanical means, and trees, bushes, green manures and cover crops should be used to prevent soil loss and as a means of direct manuring. Methods and suitable plants are discussed. *Manuring.* The various artificial fertilizers are mentioned. The dual purpose of tea manuring is to keep the bush in vigorous health and to produce an actual increase of growth for plucking and thus an increased yield. The conclusion is reached that when manuring does become necessary under Mlanje conditions with high pruned mature tea, 60 lb. of nitrogen accompanied by 30 lb. of phosphoric acid and 30 lb. of potash per acre would be efficient. A five year rotation of manures is advised, details of which are given in the Handbook of Information published by the Indian Tea Association. *Planting methods.* Spacing is generally too wide. With Indian *jāt* the spacing should be not more than  $4\frac{1}{2} \times 4\frac{1}{2}$  ft. triangular and with local *jāt* not more than  $4 \times 4$  ft. triangular. The importance of a good strain of tea is urged. The best choice would be the Indian Manipuri *jāt* and local *jāt* should be avoided. The price of high class imported tea seed has been prohibitive but Indian tea seed can now be raised locally. A good Indian tea *jāt* in Nyasaland should produce 750 lbs. of made tea per acre, whereas local tea will not produce more than 600 lb. Careful planting is particularly necessary in Nyasaland owing to the drought which prevails from June to November. The method best suited to these conditions would be the planting of 9 months old tea with the earth still on the roots (but not pressed into a compact ball) at least two months before the end of the rainy season. *Pruning.* Methods of pruning must be adapted to the conditions of the country. In Nyasaland the pruning methods seem to have been borrowed mainly from Ceylon where conditions are very different. Modifications of the existing practice which might prove beneficial are suggested. *Plucking.* The Ceylon method of plucking now largely followed is unsuitable here. An alternative which should give better results is outlined. *Pests and diseases.* At present these are few and easy to control. *Yield.* The causes of the disappointing yields per acre hitherto obtained are thought to be:—(1) The number of vacancies, which until recently it was not usual to replace; (2) the type of pruning which concentrated the yielding surface in the centre of the bushes; (3) the method of plucking, which tended to encourage an early yield and a subsequent, too early cessation of growth. *Quality.* The author does not consider that Nyasaland tea can at present aspire to more than a low medium grade even with the best factory management, which is not always available. Suggestions for obtaining the best results with the material available are given. The proposed establishment of a tea research station is discussed and the nature of some pressing problems requiring early investigation is indicated.

696. IMPERIAL BUREAU OF FRUIT PRODUCTION.

634.11 : 632.8 : 664.85.11

**Annotated bibliography on bitter pit.***Occ. Pap. Bur. Fruit Prod. E. Malling*, 3, 1934, pp. 28, 1/6.

Dr. Barker of the Low Temperature Research Station, Cambridge, notes in his introduction to this bibliography that critical information on the causal factors of this "disease" is still lacking. He considers certain of the factors which appear to have some influence on its incidence and makes suggestions with regard to future work on the subject. The paper itself is in two parts, namely (1) a comprehensive bibliography of 209 references, and (2) notes on the bibliography. The notes deal briefly with the different theories advanced by the authors in the works referred to in the bibliography.

## INDEX OF NAMES

### Horticultural Abstracts, Volume IV

<p>Abbiss, H. W., 424      Abbott, C. E., 255      Abdel-Salam, M. M., 87, 88      Abel, F. A. E., 476      Adamson, N. J., 374      Adriano, F. T., 136, 484      Aldrich, W. W., 198      Allen, O. N., 659      Altson, R. A., 650      Anderson, L. C., 544      Angeli, G. de, 31      Anon., 18, 316, 469, 593, 677, 680      Archer, W. A., 625      Arndt, F. R., 259      Atanasoff, D., 216, 494      Atwood, C. E., 42      Auchter, E. C., 333      Austin, M. D., 416</p> <p>Bach, W. J., 438      Bagenal, N. B., 315      Baibuz, V. P., 184      Baker, C. E., 527      Bal, A. J., 280      Bally, W., 311      Bane, W. A., 692      Banfield, W. M., 377      Bannerjee, B. N., 296      Barker, B. T. P., 143, 486      Barnard, C., 204      Barnes, H., 59      Barton, Lela V., 99      Batchelor, L. D., 107      Bathurst, A. C., 256      Baudin, M. R., 155      Bauer, W., 686      Beakbane, A. B., 360      Beaumont, J. H., 343      Becker, J., 587      Belgrave, W. N.C., 653      Bellier, —, 277      Bellio, G., 618, 619      Bender, H. B., 501      Bennett, A. H., 435      Bennett, J. P., 180      Berkeley, G. H., 222, 565      Berlin-Dahlem, 497      Bewley, W. F., 84, 242, 586      Bezemer, T. J., 688      Billardon, F., 295      Bioletti, F. T., 548      Blackman, V. H., 3, 317      Blanchard, V. F., 433      Blodgett, F. M., 566</p>	<p>Bobone, A., 517      Bolas, B. D., 407      Bonnet, J., 542      Bose, R. D., 4      Boswell, V., 236      Bousin, N., 53      Bovey, P., 41      Boyce, A. M., 574, 575      Bracci, F., 690      Bradfield, R., 508      Branas, M., 367      Branscheidt, P., 366      Bret, J., 214      Brien, R. M., 292      Brittain, W. H., 21, 535      Brown, H. P., 530      Bruijn, H. L. G. de, 91      Bua, G., 579      Bunyard, E. A., 15      Burke, E., 35      Burnett, F., 663      Burrell, A. B., 352      Burrier, A. S., 57      Butterfield, H. M., 543</p> <p>Caldwell, J. S., 179      Cameron, S. H., 434      Carne, W. M., 478      Carrière, E., 294      Castella, F. de, 55      Celino, M. S., 641      Chadwick, L. C., 25      Chamberlain, E. E., 411      Chandler, R. F., 344      Chandler, W. H., 354      Chapman, H. D., 614      Charley, V. L. S., 142, 297, 487, 488      Cheesman, E. E., 273, 458, 664      Cheshunt, 496      Chevalier, A., 475      Chipman, G. F., 11, 23.      Chittenden, F. J., 1      Chittenden, R. J., 120      Christie, J. R., 68      Christien, —, 168      Church, C. G., 106      Claes, F., 287      Clague, J. A., 673      Clark, J. H., 364      Clark, W. A., 100      Cleare, L. D., 656      Cochran, H. L., 405      Colby, A. S., 56      Cole, J. R., 224</p> <p>Condelli, F., 300      Condit, I. J., 516, 556      Cook, F. C., 655      Copeman, P. R. v. d., 436      Cramer, P. J. S., 470, 638, 644      Crane, M. B., 159      Crawford, M. E. F., 473      Croce, F. M., 47      Cummings, M. B., 521      Cunningham, G. H., 233      Curtis, K. M., 563</p> <p>Dalmasso, G., 554      Daniel, D. M., 74      Darbyshire, F. V., 399      Darlington, C. D., 163      Darlington, H. R., 94      Darrow, G. M., 49, 50      Davey, A. E., 66      Davidson, O. W., 351      Davies, C., 385, 386      Davis, M. B., 362      Day, L. H., 326      Decker, S. W., 420      Dennett, J. H., 446      Dennis, J. A., 258      Denny, F. E., 605      Department Scientific and Industrial Research, 312      Diehl, H. C., 137      Dieren, J. W. van, 201      Dreyer, D. J., 141      Drummond, R., 381      Ducrocq, G., 158      Dufrenoy, J., 615, 643      Dupont, R., 651      Dustman, R. B., 669      Dyk, J. W. van., 134</p> <p>East Malling Research Station, 313      Eastwood, H. W., 555      Eden, T., 115, 270      Editor, 388      Edwards, W. H., 652      Emsweller, S. L., 602      Eseltine, G. P. van., 17      Estrada, M., 622</p> <p>F. G., 111      Faes, H., 63      Fawcett, H. S., 617      Ferguson, Jessie, 93      Ferwerda, F. P., 449</p>
---	---

## INDEX OF NAMES

Fikry, A., 525  
 Finch, A. H., 353  
 Fisher, D. V., 332  
 Fitzpatrick, R. E., 221  
 Fleming, W. E., 582, 583, 585  
 Flemon, F., 519  
 Foex, E., 126  
 Fotheringham, N. S., 299  
 Francolini, F., 28  
 Freeman, W. E., 461  
 Freise, F. W., 274  
 Fruitgrower, 502  
 Fujimura, J., 524

Gabriel, B., 513  
 Gandhi, S. R., 606  
 Garner, R. J., 165  
 Gassner, G., 245  
 Geisenheim am Rhein, 498  
 Gentner, L. G., 389  
 Gibson, A., 601  
 Gloyer, W. O., 375  
 Gonzalez, L. G., 621  
 Goodwin, W., 379  
 Gossenberger, E., 189  
 Goubeaux, J., 631  
 Gould, N. K., 97  
 Grasovsky, A., 12, 127, 481  
 Greatorex, F. J., 13  
 Green, D. E., 96  
 Greenslade, R. M., 397  
 Griffiths, D., 604  
 Grubb, N. H., 33, 182  
 Guba, E. F., 243  
 Guest, E., 267  
 Guillou, R., 210  
 Guzzini, D., 550

Haas, A. R. C., 213, 509  
 Haigh, J. C., 118  
 Halma, F. F., 429  
 Harding, P. L., 482  
 Harler, C. R., 306  
 Harmon, F. N., 357  
 Hartzell, F. Z., 69, 70  
 Haseman, L., 394  
 Hatton, R. G., 9, 29, 325  
 Haviland, P. H., 445  
 Heath, O. V. S., 510  
 Heinicke, A. J., 178  
 Hell, W. F. van, 130  
 Hely, P. C., 110  
 Henderson, M. R., 231  
 Herms, W. B., 72  
 Hey, G. L., 228, 393, 395, 396  
 Hickinbotham, A. R., 206  
 Hildebrand, A. A., 383  
 Hildebrand, E. M., 376  
 Hill, H., 603  
 Hoagland, D. R., 363  
 Hoblyn, T. N., 27, 193  
 Hockey, J. F., 479  
 Holmes, L. E., 132  
 Hooper, C. H., 335  
 Horsfall, J. G., 401  
 Hough, W. S., 230, 570

Howells, D. V., 361  
 Howlett, F. S., 43  
 Hubbell, D. S., 248  
 Huckett, M. C., 71

Imperial Bureau of Fruit Production, 149, 696  
 Imperial Institute, 272, 490  
 Ing, E. G., 172  
 International Institute of Agriculture, 495, 503  
 Irvine, F. R., 305  
 Italia Agricola, 691

Jacob, H. E., 540  
 Jackson, F. K., 5  
 Jagoe, R. B., 649  
 Janert, H., 623  
 Jary, S. G., 415  
 Jennings, R. F., 612  
 Jessop, A. W., 82  
 Joachim, A. W. R., 271, 468, 685  
 Johansson, E., 590, 591  
 Jones, H. A., 86, 596  
 Jones, P. H., 268  
 De Jong, W. H., 471, 472, 610  
 Joshi, N. V., 113  
 Joslyn, M. A., 682

Kalogereas, S., 492  
 Kalshoven, L. G. E., 150  
 Karmann, W., 173  
 Karmarker, D. V., 526  
 Kausche, G. A., 276  
 Kearns, H. G. H., 392, 423  
 Keeble, Sir F., 2  
 Kelley, W. P., 511  
 Kemmer, E., 330, 358  
 Kern, E., 266  
 Kertesz, Z. I., 679  
 Kessler, H., 670  
 Keszler, H., 135, 140  
 Keszler, O. W., 215  
 Khomentovsky, G. I., 321  
 Kidd, F., 288, 290, 293  
 Kissier, J., 83  
 Knapp, A. W., 117, 684  
 Knight, H., 261  
 Knight, R. C., 36, 170, 177  
 Kobel, F., 45, 534  
 Krauss, J., 188  
 Kroemer, K., 368  
 Krug, C. A., 448  
 Kvarazkhelia, T. K., 635

Lacarelle, M. F., 154  
 Lagasse, F. S., 194  
 Lagatu, H., 371  
 Lamb, J., 683  
 Lambert, E. B., 92, 600  
 Lamourne, J., 264, 279  
 Lange, F. J., 489  
 Largillier-Seibel, H. J., 209  
 Larson, C. A., 197  
 Larson, R. H., 403  
 Larter, L. N. H., 665

Leach, R., 116  
 Lenin Academy Agr. Sciences, 318  
 Leplae, E., 622  
 Levie, E. L., 278, 687  
 Lindblom, A., 576  
 Ling, A. W., 80  
 Lloyd, F. E., 6  
 Loewel, E. L., 314  
 Long, H. C., 303  
 Longo, A., 552  
 Luce, W. A., 16  
 Lundblad, O., 573

McCallum, R. D., 597  
 McCormick, A. C., 356  
 MacDaniels, L. H., 60, 568  
 McDonald, J. A., 463, 464, 465

Maceda, F. S., 125  
 MacGillivray, J. H., 139  
 McGregor, E. A., 441  
 McKay, R., 398  
 McLean, H. C., 302  
 McLean, R. R., 620  
 Mader, —, 208  
 Magielie, M. M., 608, 609  
 Magistad, O. C., 661, 662  
 Magness, J. R., 331  
 Malencon, G., 474  
 Malherbe, I. de V., 532  
 Mally, C. W., 531  
 Manaresi, A., 39  
 Mann, H. H., 695  
 Mann, M., 238  
 Manuel, H. L., 54  
 Marsh, R. W., 378  
 Marshall, G. W., 425  
 Marshall, J., 462  
 Marshall, R. E., 40  
 Martin, H., 380, 387  
 Martyn, E. B., 426  
 Massa, L., 444  
 Massee, A. M., 227  
 Maublanc, A., 451, 452  
 Maume, L., 350  
 Melville, R., 408  
 Mendiola, N. B., 8  
 Mercado, T., 626  
 Metitzky, S. A., 166  
 Metzger, F. W., 584  
 Miedzyrzecki, Ch., 186  
 Mildner, H. B., 323  
 Miles, H. W., 76  
 Miller, L. P., 240  
 Miller, N. C. E., 577  
 Miller, P. W., 223  
 Milsum, J. N., 282, 647  
 Ministry of Agriculture, 202, 234,  
     235, 241, 499, 500, 693  
 Moen, O., 588, 589  
 Moffett, A. A., 518  
 Mol, G. A. de, 275  
 Moog, H., 51, 203  
 Moore, C. N., 151  
 Moore, J. C., 34  
 Moore, M. H., 65, 220, 232

## INDEX OF NAMES

Murray, R. K. S., 122  
 Musbach, F. L., 599  
 Mysore Agr. Dept., 283

Naudé, T. J., 262  
 Nebel, B. R.,  
 Nehru, S. S., 152  
 Newcomer, E. J., 73  
 New Zealand, 308  
 Nightingale, G. T., 196, 528  
 Niizu, N., 538  
 Nixon, R. W., 657  
 Noguchi, Y., 443  
 Noro, K., 536, 537  
 Norris, R. V., 629  
 Nowell, W., 112

Ocfémia, G. O., 627  
 O'Connor, R., 263  
 Odland, T. E., 402  
 Ogilvie, L., 373, 400  
 Ohio, 506  
 Olds, G. D. P., 133  
 Onslow, M., 289  
 Oppenheimer, H. R., 432  
 Oskamp, J., 547  
 Overley, F. L., 390

Palestine, 147  
 Park, M., 640, 654  
 Parker, E. R., 427, 439, 613  
 Parker, H. H., 493  
 Paterson, A. W., 639  
 Paterson, D. D., 507  
 Pearson, O. H., 338  
 Pennsylvania State Hort. Assoc., 310  
 Pentzer, W. T., 569  
 Petri, L., 304  
 Phillips, H. T., 514  
 Philp, G. L., 181  
 Pieris, W. I., 645  
 Pieris, W. V. D., 284  
 Pitcairn, A., 153  
 Platenius, H., 594, 676  
 du Plessis, S. J., 595  
 Porter, D. R., 48  
 Post, K., 417  
 Potter, G. F., 346  
 Potter, R. S., 298  
 Pound, F. J., 456, 457, 459, 460  
 Pridham, A. M. S., 418  
 Proebsting, E. L., 38, 345, 347  
 Prosperi, V., 553  
 Putterill, V. A., 678  
 Pyke, E. E., 453, 454, 455  
 P(yke), E. E., 119

Quayle, H. J., 440  
 Quinn, G., 253, 254

Racah, V., 52  
 Ramos, P., 630  
 Rawes, A. N., 19, 89  
 Rawlins, T. E., 522

Read, W. H., 422  
 Reed, H. S., 183, 485, 541  
 Reggio Calabria, 694  
 Reichert, L., 437, 616  
 Revue Horticole Suisse, 10  
 Richardson, J. K., 90  
 Riker, A. J., 376  
 Riveros, J. E., 551  
 Roach, W. A., 191, 192, 322  
 Robinson, R. M., 78  
 Robinson, T. R., 101  
 Rogers, W. S., 175, 328, 329  
 Rohrbaugh, P. W., 108  
 Roscoe, Muriel V., 22, 160  
 Rose, D. H., 291  
 Rozet, B., 156  
 Rubber Research Scheme, Ceylon, 505  
 Rudloff, C. F., 164, 340, 560  
 Rudolph, B. A., 558  
 Russell, P., 419

Saliba, F., 549  
 Sansome, F. W., 162  
 Sass, J. E., 167  
 Savage, C. G., 660  
 Savastano, G., 539  
 Sax, K., 320  
 Schanderl, H., 44, 339  
 Schmidt, A. W., 301  
 Schultz, H., 334  
 Schwarz, Luise, 26  
 Scoville, G. P., 546  
 Secretain, C., 689  
 Shamel, A. D., 104, 105, 257  
 Sharples, A., 123  
 Shaw, L., 564  
 Shima, Z., 561  
 Shuck, A. L., 404  
 Shultz, A., 14  
 Sideris, C. P., 477  
 da Silveira, J. C., 642  
 Silvestri, F., 578  
 Simmonds, J. H., 286  
 Sitz, M., 512  
 Smith, A. M., 247  
 Smith, F. F., 67  
 Smith, H. S., 62  
 Snyder, J. C., 206  
 Solianikoff, P., 515, 671  
 Stahel, G., 668  
 Staniland, L. N., 98  
 Stapley, J. H., 391  
 Stearns, L. A., 229  
 Steer, W., 226  
 Steinegger, P., 20  
 Stewart, W. D., 592  
 Stoffels, E., 281  
 Storey, H. H., 61  
 Strachan, C. C., 161  
 S. S. and F.M.S. Dept. Agr., 124, 133  
 Strom, R., 187  
 Suit, R. F., 620  
 Susa, T., 523  
 Sutherland, J. B., 128  
 Swarbrick, T., 365

Talbot, P., 412  
 Tanaka, S., 64  
 Tanaka, Y., 174  
 Taschdjian, E., 637  
 Taubenhaus, J. J., 246  
 Thomas, E. N. M., 132  
 Thomas, H. E., 562  
 Thomas, J. E., 207  
 Thomas, L. A., 349  
 Thomas, W., 37, 348  
 Thompson, A., 658  
 Thompson, C. R., 359  
 Thompson, D. J., 108  
 Thompson, H. C., 409  
 Tiedjens, V. A., 195  
 Tiller, L. W., 480, 529  
 Tincker, M. A. H., 79  
 Tosti-Croce, E., 337  
 Townsend, G. R., 598  
 Toxopeus, H. J., 102  
 Traetta-Mosca, F., 674  
 Trask, E. E., 265  
 Traub, H. P., 58, 260, 372, 447  
 Trench, A. D., 450  
 Trinidad, Imperial College of Tropical Agriculture, 504  
 Trouchaud, F., 580  
 Truscott, J. H. L., 384  
 Tubbs, F. R., 269  
 Tufts, W. P., 336  
 Tukey, H. B., 24, 30, 249, 319, 327  
 Turnbull, R. F., 483  
 Tydeman, H. M., 169, 171

Uganda, 148  
 Uphof, J. C. Th., 200, 251  
 Upshall, W. H., 370

Vaile, J. E., 545  
 Vanwijngaerden, G., 581  
 Vassie, J. D., 199  
 Veh, R. von., 185, 341  
 Veitch, R., 285  
 Vekhov, N. K., 324  
 Venezia, M., 681  
 Vernay, P., 210  
 Verner, L., 342  
 Vesselovskaya, M., 7  
 Viala, P., 382  
 Vinet, E., 211  
 Vinik, M., 431  
 Vivarelli, L., 157  
 Vivoli, G., 648  
 Voelcker, O. J., 467  
 Vogel, F., 239  
 Vollema, J. S., 121  
 Vyvyan, M. C., 176

Wahlberg, H. E., 611  
 Wallace, T., 190  
 Walton, C. L., 413  
 Wardlaw, C. W., 129, 131, 138, 666, 667, 675  
 Ware, W. M., 414  
 Wassermann, J., 628

## INDEX OF NAMES

Webber, H. J., 430  
Weiss, F. E., 95  
Welch, J. H., 252  
Wellensiek, S. J., 632, 633, 634,  
    636  
West, E. S., 250, 428  
West Indies, 146  
Westcott, C., 421  
Western Nutgrowers Association,  
    500  
Westover, K. C., 406  
Whyte, R. O., 316  
Wiesmann, R., 75, 571, 572

Wilcox, R. B., 218  
Wilcoxon, F., 85  
Wilson, E. E., 557  
Wilson, P. W., 237  
Wiltshire, J. L., 646  
Windle, E. G., 307  
Winkler, A. J., 369  
Wood, M. N., 212  
Wood, R. C., 114, 624  
Woodhead, C. E., 32  
Woodrow, A. W., 46  
Wormald, H., 219  
Worsley, R. R. Le, G., 491

Wright, R. C., 244  
Wye, 145  
Yarnell, S. H., 410  
Yedidyah, S., 103, 607  
Yothers, M. A., 225  
Young, P. A., 77, 567  
Zaretskii, A. Ja., 442  
Zeller, S. M., 217, 559  
Zhukovsky, P., 144  
Zimmermann, E., 365  
Zurbicki, Z., 81

## SUBJECT INDEX

### Horticultural Abstracts, Volume IV

Abaca, bumpy top of, 627  
Africa—  
    South-West, vinegrowing prospects in, 208  
    West, textbook of agriculture, 305  
*Agave*, 112  
Agriculture—  
    in 1932-3, 495  
    tropical, bibliography of, 503  
*Alberita*, fruitgrowing in, 11  
*Aleurites moluccana*, 274  
Alkali—  
    scorch of Bermuda onions, 246  
    soils, reclamation, 511  
Almond, rootstocks for, 168  
Altenland, research work in, 314  
*Alternaria kikuchiana*, 64  
Ammonium—  
    bicarbonate in orange storage, 481  
    and nitrate nitrogen absorption by apple, 195, 196  
    and nitrate nitrogen absorption by apple and tomato, 195  
Ampelography; 51, 203  
Analysis—  
    semi-micro, 350  
    statistical, 507  
    sugars in pineapple juices, 476  
Anatolia—  
    agriculture in, 144  
    *Prunus cerasifera* seedlings from, 164  
Angus, raspberry growing in, 199  
Annual reports—  
    Berlin-Dahlem, 497  
    Cacao research, 3rd ann. rept., 504  
    Cheshunt, 496  
    East Malling, 313  
    Food Investigation Board, 312  
    Geisenheim, 498  
    Long Ashton, *see* particular subjects  
    New Zealand Dept. Sci. and Indust. Res., 308  
    Palestine Dept. Agric., 147  
    Rubber Research Board, 505  
    Trinidad, Imp. Coll. on cacao research, 504  
    Uganda, Dept. Agric., 148  
*Anthonomus pomorum*, 396  
*Antirrhinum* rust, 96, 602  
*Aphelechoides fragariae*, 68  
*Aphelechoides ritzema-bosi*, 423  
Aphids—  
    black cherry, 70  
    control by tar distillates, 69, 70  
    control by nicotine supplements, 71  
    rosy, 69  
    woolly, 397, 398  
*Apioidea*, visiting apple blossom, 42

Apparatus for—  
    budding and grafting, 322  
    drain making, 623  
    olive picking, 542  
    packing fruit, 514  
    ringing citrus, 258  
    soil compactness estimation, 510  
    spraying, 385, 386  
    washing fruit, 302  
    water supply, 512

Apple(s)—  
    aphis control, injury due to, 398  
    arsenic injury on, 390  
    Belle de Boskoop, 185  
    biennial bearing, 355, 356  
    bitter pit, 216, 696  
    blackening caused by *Sclerotinia* sp., 381  
    blossom weevil, 396  
    breeding, 20, 21, 22, 23, 159, 160, 169, 321, 341  
    bruising and freezing in store, 291  
    budding, after care, 166, 323  
    bud variations in Delicious, 161  
    callus knots on piece root grafts, 167  
    canker, 220  
    chromosomes, 22, 160, 162  
    cider, 486  
    codling moth on, 229, 230, 570  
    cork disease affected by irrigation, 352  
    crab, 17  
    crown gall, 375, 376  
    Delicious, colour strains in, 161  
    dwarf seedlings, 519  
    drought, affected by, 527  
    egg and zygote sterility in, 20, 341  
    fertilizers, 16, 35, 37, 193, 194, 195, 196, 197, 342, 346, 348  
    fireblight in, 564  
    flowering, relative order of, 335  
    fruit bud, 331  
    fruitfulness, 21  
    fruit miner, 391  
    fruit set affected by sulphur, 568  
    fruit set, prevention by spraying, 333  
    gas storage, 288  
    genetics, *see* breeding  
    grafting, 165, 166, 167  
    growth affected by leaf area, 332  
    growth affected by pruning, 36  
    growth distribution, 176  
    growth, nutrients used in, 35  
    hairy root, 375, 376  
    hardiness, breeding for, 23  
    insects visiting, 42  
    irrigation, 352  
    Japanese flowering crab, 17  
    juice, 297  
    leaf area, 332

## SUBJECT INDEX

**Apple(s) (continued)—**  
 leaf, photosynthesis of, 178  
 location affecting, 16  
 manuring, *see fertilizers*  
 maturity determination, 529  
 metabolism, 528  
 metaxenia, 533  
 mildew, 65  
 Northern Spy rootstock, 32  
 nutrition, 35, 37  
 packing, 482, 693  
 in Palestine, 12  
 photosynthesis, 178  
 picking time related to spot scald, 479  
 pollination, 42, 43, 185, 186, 335, 341, 561  
 polyploidy and vitamin C, 162  
 propagation, 24  
 pruning, 36, 358, 527  
 recording, 177  
 ringing, 289  
 root growth, 30, 36, 175, 176, 177, 329,  
     523  
 rootstocks—  
     breeding, 169  
     intermediate, 30  
     Northern Spy, 32  
     root and stem influence, 170  
     root system affected by, 329  
     vigour affected by, 176  
 ruts of stored, 292  
 russet on, 374  
 sawfly, 228, 392, 393  
 scab, 65, 378, 379, 392, 560  
 scald, superficial, 290  
 scion influence on root growth, 30  
*Sclerotinia Malii* infection, 561  
 seed content, 21  
 senescence in stored, 289  
 Sieboldii group, flowering crabs of, 17  
 size affected by leaf area, 332  
 size affecting root and stem relations, 177  
 soil effect on, 329  
 sports, 161  
 spot scald, 479  
 spray damage, 77  
 spray effect on, 233, 567, 568  
 spray residue, removal of, 569  
 stem growth, 36  
 sterility of egg and zygote in, 20, 341  
 storage, 288, 289, 290, 291, 292, 478, 479,  
     669, 670, 671  
 strains of Delicious, colour, 161  
 superficial scald, 290  
 thinning, 355, 356  
 topworking, 165  
 triploids, 20  
 varieties, 19  
 vitamin C and polyploidy in, 162  
 wastage in Tasmanian, 478  
 wedge graft, 520  
 Wisley trials, 19  
 woolly aphis, 397, 398  
 wound overgrowth, 376  
 xenia in, 533  
 zygote sterility in, 20, 341

**Apricot (continued)—**  
 pruning and growth, 183, 541  
 rootstocks, 168  
*Argyresthia conjugella*, 391  
 Arrachacha, 287  
 Arrowroot, 268  
**Arsenic—**  
     injury to apples, 390  
     residues, 78, 569  
     sprays, 229  
**Asparagus—**  
     cultivation experiments, 89  
     rust, 245  
**Australian nut, 59, 555**

**Avocado—**  
     cultivation, 264  
     propagation, 447  
     scale, 620  
     storage, 138  
     topworking, 265

**Bacillus amylovorus, 562, 563, 564**  
**Bacterial canker of stone fruits, 219, 557**  
**Bacteriosis of walnut, 223, 558**  
**Bacterium Juglandis, 223, 558**  
**Banana(s)—**  
     breeding, 664  
     breeding against Panama disease, 128  
     in British Guiana, 663  
     bunchy top disease, 286  
     cases, 483  
     diseases, 128, 129, 130, 131, 286, 666, 667,  
         668  
     fruit spots, 129  
     Gros Michel sports, 665  
     leaf diseases, 131  
     packing, 483  
     pitting disease, 129  
     sports, 665  
     stomata spots, 130  
     thrips, 285  
     wild and cultivated forms, 475

**Bartlett pears, 14, 336, 347**  
**Bayoud disease of dates, 126, 474**  
**Bees, value in pollination, 46, 535**  
**Beetle, Japanese, 582, 583, 584, 585**  
**Belaté disease of date, 126**  
**Belle de Boskoop, cytology of, 185**  
**Berlin-Dahlem ann. rept. for 1933, 497**  
**Berry, fig steaming experiments at, 299**  
**Berry fruits in California, 543**  
**Biennial bearing in apple, 355, 356**  
**Bigaradia orange, 609**  
**Biochemical investigations—**  
     on pears, 34  
     on pineapples, 132  
     of senescence in apples, 289

**Biological control of oriental fruit moth, 74**  
**Bitter pit, 216, 696**  
**Blackberry—**  
     breeding and cytology, 49  
     training, 360

**Black spot disease of Japanese pear, 64**  
**Blossoming, irregular, control of, 531**  
**Borax treatment of fruits, 484**

## SUBJECT INDEX

Bordeaux spray, 233, 558, 641  
 Boron deficiency in strawberries, 363  
*Botrytis* disease of lettuce, 88  
 Brand canker of rose, 421  
*Brassolis sophorae*, 656  
 Breeding—  
 apples, 20, 21, 22, 23, 159, 160, 169, 321,  
     341  
 bananas, 128, 664  
 cacao, 458  
 cherries, 163  
 onions, 86  
 plum, 164  
*Pomoideae*, 320  
*Prunus*, 163, 164, 319  
*Rubus* sp., 49  
 Russian work, 318  
 strawberries, 50  
 water melons, 48  
*Bromeliaceae*, morphology and biochemistry of, 132  
 Buckskin disease of cherry, 522  
 Budding—  
 apples, 166, 323  
 cacao, 457  
 razors, 322  
 rubber, 276  
 technique, 323  
 Bud variation, *see also* Sports—  
 in apple, 161  
 in citrus, 102  
 induced by vegetative propagation, 8  
 Bulbs—  
 gladiolus, 605  
 hot water treatment of narcissus, 97, 98  
 from seed, 604  
 sterilization and dusting, 424  
 Bunchy top—  
 of abaca, 627  
 disease of banana, 286  
*Byturus tomentosus*, 226  
 Cabbage—  
 manuring, 402  
 soil treatment against club root, 403  
 Cacao—  
 bean size, 639  
 branching, 455  
 breeding, 458  
 budded, 457  
 characteristics wanted by trade, 117  
 composition of tree, 465  
 disease, 640  
 ecological studies, 466  
 fermentation, 684  
 fertility, 462, 467  
 fruitfulness, 460  
 manuring, 460, 464, 465  
 nutrition, 460, 465  
 pigment factors, 456, 461  
 pod morphology, 461  
 pollination, 462, 467  
 selection, 458, 459  
 soil surveys, 463  
 type wanted commercially, 117  
 variability in budded, 457  
 vegetative propagation, 273, 453, 454, 455  
 Calcium—  
 deficiency and excess in strawberry nutrition, 362  
 determination by semi-microanalysis, 350  
 California—  
 fig growing in, 516  
 bush berry growing in, 543  
 plant quarantines in, 62  
 Callus—  
 knots on apple piece root grafts, 167  
 formation on *Hibiscus Rosa sinensis* and *Hevea brasiliensis*, 123  
 phenomena on budding rubber, 276  
 Candleberry tree, 274  
 Canker—  
 apple, 220  
 bacterial, of stone fruits, 219, 557  
 of tea, gnarled stem, 116  
 Canning—  
 orange juice, 682  
 peas, fertilizers for, 599  
 tomatoes, 139  
*Capsicum frutescens*, abnormal fruits, 405  
 Capsids on tea, 116  
 Carbohydrate(s)—  
 content of irradiated stored apples, 669  
 and nitrogen in fruit trees, 526  
 Carbon dioxide—  
 in glasshouses, 237, 238, 590, 591  
 experiments with melons, 590  
 effect on mushrooms, 92  
 Carnivorous plants, 6  
 Carrot—  
 changes during growth, 594  
 the Peruvian, 287  
 Centrifuging cider to control fermentation, 488  
*Cercospora musae*, 667  
*Ceresa* spp., 225  
 Ceylon—  
 rubber research scheme, 505  
 tea research institute of, 629  
 Cherry—  
 aphid, the black, 70  
 blossom and fruit abnormalities, 181  
 breeding sweet, 163  
 buckskin disease and rootstock, 522  
 fruit fly, 75, 571, 572  
 oriental flowering, 419  
 pollination, 44, 45, 534  
 propagation, 521  
 pruning, 182  
 rootstocks, 33, 173, 521, 522  
 stocks for morello, 33  
 sucker formation, 182  
 sweet, chromosomes in, 163  
 in Victoria (Aust.), 13  
 Cheshunt ann. rept. for 1933, 496  
 Chlorine in vine leaf, diagnostic value of, 207  
 Chlorosis and iron deficiency, 353  
 Chromosome content—  
 of apples, 22, 160, 162  
 of *Prunus Avium*, 163  
 Chrysanthemum—  
 eelworm, 423  
 early flowering induced by reduced day light, 417  
 nutrition, 603  
*Cicadulina mbila*, a virus vector, 61

## SUBJECT INDEX

Cider—

- apple culture, 486
- centrifuging to control fermentation, 488
- action on metal, 487
- pomace, use of, 143
- Cinchona*, seedling blight, 641
- Citrus* and sub-tropical fruits, 101-111, 250-266, 425-444; 606-620
- Citrus*—*see also* particular species  
in British Guiana, 426  
brown rot gummosis, 108  
bud variation, 102  
cuttings, 608  
deficiency symptoms, 615  
diseases, 304, 437, 438, 616, 617, *see also* particular diseases  
diseases and pests, 304  
diseases in Palestine, 437  
diseases, root, 438  
essential oils, 694  
extracts, 694  
field experiments, 427  
flower morphology, 251  
fruit bud development, 255  
fumigation, 110, 440, 618, 619  
girdling, 105, 106, 257, 258  
at Griffiths, N.S.W., 250  
gummosis, 108  
in India, 606  
irrigation, 431, 432  
juices, vitamin content, 435  
manuring, 256, 431, 614, 615  
mottle leaf, 107, 439  
nutrition, 614, 615  
oil sprays, 109, 261  
packing, 678  
propagation, 608  
psoriasis, 617  
red scale, 110, 440, 441  
in Rhodesia, 425  
root development, 428  
rootstocks, 103, 168, 253, 254, 430, 608, 609, 610  
sanitation experiment, 263  
scion influence, 429  
soils, phosphate affecting manuring, 614  
thinning, 613  
thrips, 262, 441  
vitamins in juice, 435  
wastage, 678  
water relations, 432  
weather affecting, 612  
windbreaks for, 433, 611  
wind, influenced by, 433  
*xyloporosis*, 616

Club root, soil treatment against, 404

Coconut—

- caterpillar, 656
- in Ceylon, 284, 651
- drought, yield affected by, 654
- in Jamaica, 652
- in Malaya, 653
- manuring, 653
- in Mysore, 283
- nut shape related to seedling growth, 125
- seedlings related to nut shape, 125
- in Seychelles, 651
- variations, 284
- weight : meat ratio, 655

Codling moth, 72, 73, 229, 230, 394, 570

Coffee—

- arabica* strains, 637
- in Belgian Congo, 622
- cytology, 448
- Empire production, 272
- grafting, 638
- in India, 307
- in 1931 and 1932, 311
- phthiriosis, 451
- roots, 450
- rust, 452
- shading, 124
- vegetative propagation, 449, 638
- Cola acuminata*, vegetative propagation, 119
- Conference proceedings, 146, 309, 310
- Congo, Belgian, cotton, coffee and oil palm in, 622
- Coniothyrium Wernsdorffiae*, 421

Copper—

- dust and spray, distribution determination, 566
- fungicides, use on cucumber, 243
- oxide, dusting seed with red, 401
- in tracheal sap of fruit trees, 180
- Copra preparation, 651
- Cork disease in apple affected by irrigation, 352
- Cork oak in U.S.S.R., 266
- Costs, reduction in orcharding, 514
- Cotoneaster, vegetative propagation of, 100
- Cotton in Belgian Congo, 622
- Coulure of grape crop, 55
- Court-noué disease of vine, 382
- Cover crops, 38, 39—*see also* Manuring, green
- Crab apples, Japanese flowering, 17

Cranberry—

- in Holland, 201
- false blossom disease, 218
- keeping quality, 673
- in U.S.A., 200

Crinkle disease of strawberry, 217, 373

Cropping of fruit trees affected by weather, 334

Crown gall—

- in apple, 375, 376
- in red raspberry, 377

Cucumber—

- effect of HCN on, 243
- physiological disorders in, 242

Currant—

- red, fertilizers for, 544
- dried grape, trade in, 686

Curry stuffs, on the identity of some, 118

Customs regulations in international fruit trade, 513

Cuttings—

- cacao, 453, 454, 455
- chemical treatment of, 26
- citrus, 608
- moisture in relation to rooting, 420
- plum rootstocks, propagation by root, 27
- rooting of, 26, 420
- rose, 249
- summer, of trees and shrubs, 324
- tea, 636
- vine, rooting of, 53, 367
- warm water treatment, 26

Cylinders, apple nutrition trials in, 37

## SUBJECT INDEX

*Cylindrophora albedinis*, 126—*see also* Bayoud  
 Cyprus, fruits and vegetables from, 153  
 Cytology—  
     *Coffea*, 448  
     pears, 518  
     *Rubus* sp., 49

*Dacus oleae*, 578, 579  
 Damping off—  
     control by dusting seed, 401  
     of lettuce, 87  
 Date palm—  
     bayoud disease, 126, 474  
     belāat disease, 126  
     the Dairee, 657  
 Daylight—*see also* Vernalization  
     effect of reducing, on chrysanthemum, 417  
     effect of reducing, on strawberry, 545  
 Deficiency of nutrients—  
     in citrus, 615  
     in strawberry, 362, 363  
 " Degeneration " of strawberry, 149  
 Delicious apple, colour strains in, 161  
 Derris, 124, 231, 388, 396, 577  
 Diagnosis—  
     leaf, in vine, 207, 371  
     wood, in vine, 211  
 Dictionary, horticultural, English, French, German, Dutch, 688  
 Direct producers, vine, 209, 210  
 Disease(s)—*see also* under particular plants and diseases  
     bacterial, *see* Bacterial  
     bitter pit, 216, 696  
     control in Switzerland, 63  
     bulb diseases, 424  
     fungus and other, 1928-32, 500  
     health and, in plants, 586  
     physiological, 107, 190, 191, 205, 207, 213, 216, 242, 304, 352, 353, 354, 374, 439, 525, 530, 531, 532, 615  
     virus, *see* Virus  
 Draining machine, 623  
 Drought—  
     and water conductivity in apple trees, 527  
     effect on coconut yield, 654  
 Durian, a disease of, 658  
 Dusting—  
     apple blossom weevil, 396  
     apple scab and mildew, 65  
     citrus pests, sulphur, 441  
     copper, 566  
     seed, 401  
 Dwarf, strawberry, 68  
 East Malling res. sta.—  
     ann. rept. for 1933, 313  
     twenty-one years' work at, 315  
 Eelworm—  
     of chrysanthemum, 423  
     *H. schachttii* and " pea sickness ", 413  
 Egg plant—  
     paper mulching, 406  
     wilt, 90  
*Elaeis guineensis*, 124, 281, 282, 622, 649, 650  
 Electric cables for heating soil, 589, 593  
 Electroculture, 152  
 Empire coffee production, 272  
 Environment—  
     control in glasshouses, 237, 238  
     and growth of strawberry, 545  
*Eriophyes similis*, 576  
*Eriosoma lanigerum*, 397, 398  
 Eritrea, fruits grown in, 444  
 Erosion, soil, 270, 445  
 Essential oils—  
     citrus, 694  
     from East Africa, 490, 491  
 Ethylene treatment for—  
     apples in store, 669  
     fruit ripening, 484  
     gladiolus cormels, 605  
 Evaporation, a method of measuring, 466  
 Experiments, field—  
     citrus, 427  
     lay out in general, 4, 5, 446  
     pineapples, 662  
     vines, 365, 548  
 Exports of fruit to and from tropics, 278  
 Fats, production in Africa, 489  
*Feijoa Sellowiana*, 648  
 Fermentation in cider controlled by centrifuging, 488  
 Fertility—  
     in cacao, 462  
     garden, 2  
 Fertilizers—*see also* Manuring  
     apple, 16, 37, 193, 194, 195, 196, 197, 342, 346, 348  
     apricot, 345  
     cabbage, 402  
     cacao, 460, 464, 465  
     currant, red, 544  
     Heda lance, injection by, 189, 587  
     hydrogen-ion, effect on absorption of, 351  
     injection, 191; 192, 349  
     nitrogenous, 40, 194, 195, 196, 342, 345, 346, 348, 351, 588  
     peach, 40, 345, 351  
     pear, 16, 347  
     pea, 599  
     phosphatic, 345  
     potassium, 343, 344  
     prune, 345  
     soil injection, 189, 587  
     effect on storage, 342, 343  
     strawberry, 362, 363, 364, 545  
 Fibre producing *Agave*, 112  
 Field experiments, *see* Experiments  
 Fig.—  
     in California, 516  
     cultivation, 15, 516  
     mosaic, 556  
     processing the Magnolia, 485  
     spoilage, 66  
     steaming, 299  
 Fireblight, 562, 563, 564  
 Fish poison plants, 625  
 Flower growing, 93-100, 248-249, 417-424, 601-605  
 Flower(s)—  
     abnormal, in sweet cherry, 181  
     bud in roses, 248, *see also* Fruit bud  
     citrus, morphology of, 251  
     garden, insects of, 601  
 Flowering, early, induced by reduction of day-light, 417

## SUBJECT INDEX

Fluorine compounds for control of codling moth, 73  
 Foliation, control of irregular, 531  
 Food investigation board, rept. for 1932, 312  
*Fragaria*, see Strawberry  
 Frames, cultivation of vegetables in, 234, 590  
 Freezing—  
     of fruits and vegetables, 137  
     of Philippine fruits, 136  
     of tomatoes in transit, 244  
 Frost—  
     protection, 214, 215  
     russet on apples due to, 374  
     vines damaged by, 389  
 Frozen pack products, 136  
 Fruit(s)—  
     abnormal in sweet cherries, 181  
     bud—  
         apple, 381  
         citrus, 255  
         Concord grape, 206  
         sultana, 204  
     cut, prevention of discolouration, 680  
     fly, the cherry, 75, 571, 572  
     grower, Empire trade number of, 502  
     growing—  
         important considerations, 9  
         in Manitoba, Saskatchewan, Alberta, 11  
         in Java, 647  
         *revue horicole suisse*, special number on, 10  
     hydron concentration affected by growth and ripening, 179  
     juices, 142, 298  
     preservation by freezing, 136, 137  
     products from English, 142, 143  
     research in Morocco, 154  
     set—  
         prevention by spraying, 333  
         spray influence on, 568  
     soft, bulletin on, 499  
     syrups, 142  
     washer, 302  
     wines, 142  
 Fumigation—  
     citrus, 110, 440, 618, 619  
     cucumbers, 243  
     greenhouse with naphthalene, 85  
     greenhouse with sulphur, 422  
 Fungi—  
     *Imperfecti Sphaeropsidales*, 501  
     in stored apples, 292  
 Fungicide—contact insecticide sprays, 232  
 Fungicides, sulphur, effect on set of apples, 568  
 Fungus and other crop diseases in England and Wales, 1928-32, 500  
 Gambier production, 275  
 Garden(s)—  
     fertility, 2  
     Royal horticultural society's, 1  
 Garlic, 597  
 Gas storage of apples, 288  
 Geisenheim on Rhine res. sta. ann. rept. for 1933, 498  
 Genetical studies in cultivated apples, 159  
 Gentian, germination and seedlings of, 95  
 Germany, fruit growing since 1880 in, 334  
 Germination and seedling growth of horticultural plants, relation between, 83  
 Ginger—  
     curing, 685  
     manuring and cultivation, 468  
 Girdling—  
     apples, 289  
     oranges, 105, 106, 257, 258  
 Gladiolus corms treated with ethylene chlorhydrin, 605  
 Glasshouse—  
     atmospheric control, 237, 238  
     CO<sub>2</sub> content, 591  
     crops, health and disease in, 586  
     fumigation, 85, 422  
     heating, 84  
     injury due to sulphur fumigation, 422  
     physiological disorders in crops, 242  
     tomatoes, freezing in transit, 244  
*Gnomonia caryae pecanae*, 224  
 Grafting—see also Topworking, etc.  
     apples, 185, 186, 167  
     callus knot formation, 167  
     coffee, 638  
     overgrowth control by wedge graft, 520  
         "porcupine", 165  
     razors, 322  
     technique, 165, 166  
     wedge, 520  
 Grapes, see Viticulture  
 Grapefruit—  
     Marsh Seedless, origin of, 101  
     new variety, 252  
*Grapholita molesta*, 74  
 Grass, disadvantages of cultivation under, 187  
 Greenhouse, see Glasshouse  
 Griffith, N.S.W., citrus research at, 250  
 Growth—  
     affected by hydron concentration, 179  
     affected by leaf area in apples, 332  
     affected by light and temperature, 3, 316, 317  
     affected by manganese deficiency, 240  
     affected by nutrients in apple trees, 35  
     affected by soil treatment, 509  
     distribution in apples as affecting stock influence, 176  
     of seedlings, relation between germination and, 83  
 Gummosis in citrus, control by zinc sulphate, 108  
 Hairy root in apple, 375, 376  
 Hardiness, breeding apples for, 23  
 Hawthorn, dwarf seedlings, 519  
 HCN—  
     fumigation of citrus, 110, 440, 618, 619  
     effect on cucumbers, 243  
 Health and disease in plants, 586  
 Heat, effect on tomato pigment, 139  
 Heating—  
     glasshouses, 84  
     soil, 589, 593  
 Heda fertilizer lance, 189, 587  
*Helopeltis bergerothi*; 116  
 Hemp, bunchy top of manila, 627  
 Herbs, cultivation of, 82  
*Heterodera schachtii* and "pea sickness", 413  
 Hevea, see Rubber  
*Hibiscus Rosa sinensis*, callus formation in, 123  
 Holland, possible fruit trade with East Indies, 278  
 Hop industry, 493

## SUBJECT INDEX

*Hoplocampa* spp., 76, 228, 392, 393  
 Hoppers, tree, 225  
 Horticulture—Miscellaneous, 1-8, 150-153, 314-317, 506-513  
 Humidity, atmospheric, method of measuring, 466  
 Hydron concentration changes in fruits, 179  
 Hydrocyanic gas, *see* HCN  
 Hydrogen-ion concentration of nutrient—  
 influence on N absorption, 351  
 influence on strawberry growth, 364  
 Illipe nuts, 280  
*Incunaria rubiella*, 573  
 Indo-China, tea growing in, 631  
 Injecting—  
 fertilizer into soil, 189, 587  
 fruit trees, 191, 192, 349, 354  
 zinc to cure rosette, 354  
 Insect(s)—*see under* particular pests or plants  
 of flower gardens, 601  
 olive, 578, 579  
 strawberry, 149  
 virus vectors, 61  
 visitors to fruit blossoms, 42  
 Insecticide spray, fungicide-contact, 232  
 Iodine—  
 starch reaction as apple maturity test, 529  
 effect on vegetables, 239  
 Iraq, plants and plant products in, 267  
 Iron—  
 deficiency and chlorosis, 353  
 in pineapple plant, availability, 477  
 in tracheal sap of fruit trees, 180  
 Irradiation—  
 of stored apples, 669  
 of vegetables, 592  
 Irrigation—  
 apples, 175, 352  
 citrus, 431, 432  
 cork disease in apples affected by, 352  
 in Palestine, 512  
 pears, 198  
 Japanese—  
 beetle, 582, 583, 584, 585  
 citrus propagation, 608  
 flowering crab apples, 17  
 pear, 536, 537  
 persimmon, 174, 442, 443  
 plum and its hybrids, 158  
 Java, fruit growing in, 647  
 Juice—  
 apple, 297  
 fruit, 298  
 pineapple, sugar estimation in, 476  
 pineapple, to prevent discolouration, 680  
 Kaki—  
 cultivation, 442  
 metaxenia in, 443  
 rootstocks for, 174  
 Kapok, budding and grafting, 626  
 Kent, fruit soils on lower greensand in, 692  
 Kola, vegetative propagation, 119  
 Kudzu vine, 113  
 Latex from clone and seedling rubber, 646  
 Layering tea, 635  
 Lay out of field experiments, *see* Experiments  
 Lead and arsenate spray damage, 78, 569

Leaf—  
 apple, nutrients used by, 35  
 apple, photosynthesis in, 178  
 area affecting apple tree growth, 332  
 diagnosis in vine, 207, 371  
 "little leaf", 354, 532  
 Lemon—  
 cuttings of rough, 608  
 juice, vitamin C in, 435  
 pruning of Eureka, 104  
 rootstocks for, 430  
 Lettuce—  
*Botrytis* disease of, 88  
 bottom rot of, 598  
 damping off, 87  
 seed germination, 404  
 Light—  
 absorption affected by spray deposit, 368  
 effect of, on apples, 669  
 effect of, on chrysanthemum flowering, 417  
 effect of, against codling moth, 72  
 effect of, on plant growth, 8, 316, 317  
 effect of, on tomato assimilation, 407, 408  
 effect of ultra violet, on apples, 669  
 Lime sulphur on apples, following bordeaux, 233  
 Little leaf of fruit trees, 354, 532  
 Liver spot disease of pecans, 224  
 Location, effect on apples and pears, 16  
 Logan—  
 beetle, 226  
 breeding and cytology, 49  
 training, 360  
 Loquat, rootstocks for, 168  
 Lubrication, olive oil for, 300  
 Lyssenko's method for seed pre-treatment, 316, 317

*Macadamia ternifolia*, 59, 555  
 Magnesium—  
 deficiency and excess in strawberry nutrition, 362  
 determination by semi-microanalysis, 350  
 Mahaleb rootstock for sweet cherries, 173  
 Malaya—  
 coconuts in, 653  
 pineapple work in, 133  
 sources of "tuba" in, 231  
 Mandarin orange, 609  
 Manganese deficiency in vegetables, 240  
 Mango—  
 marketing, 687  
 propagation, 447, 471  
 rootstocks, 610  
 smudging, 472  
 storage, 296  
 vitamins in, 473  
 Manitoba, fruitgrowing in, 11  
 Manuring, *see also* Cover crops, Fertilizers, Nutrition—  
 apples, 193, 194  
 cabbage, 402  
 carbon dioxide, 237, 238, 590, 591  
 citrus, 256, 431, 614  
 coconuts, 653  
 ginger, 468  
 green, 113, 134, 271, 624, 659, 661  
 iodine, 239  
 leaf diagnosis of needs, 207, 371  
 pineapples, 124, 133, 659, 661

## SUBJECT INDEX

Manuring (continued)—  
 tea, 115  
 vegetable, 235, 587, 588  
 vines, 207, 211, 371

Marsh Seedless grapefruit, 101

Marsh spot of peas, 91

Masters memorial lectures, 2, 3, 317, 586

Melons—  
 breeding of water, 48  
 CO<sub>2</sub> experiments in frames with, 590

Metabolism—apple and tomato, 528

Metal, action of cider on, 487

Metaxenia—  
 apple, 533  
 pear, 336  
 Japanese persimmon, 443

Mites—  
 broad, 67  
 cyclamen, 67  
 plum gall, 576  
 strawberry, 149, 227

Morello—  
 rootstocks for, 33  
 shade, a self-sterile strain of, 44

Morocco—  
 fruit introductions into, 156, 277  
 fruit research in, 154  
 fruit tree registration in, 155

Morphology—  
 cacao pod, 461  
 citrus flower, 251  
 pineapple, 132

*Morus* sp., 157, 689

Mosaic—  
 fig, 556  
 tomato, 411

Moth—  
 cooling, 72, 73, 229, 230, 394, 570  
 oriental fruit, 74

Mottle leaf in citrus, 107, 439

Muden, work on citrus thrips at, 262

Mulberry, 157, 689

Mulch trials, paper—  
 peppers and egg plant, 406  
 pineapples, 660

Mushroom(s)—  
 affected by excess CO<sub>2</sub>, 92  
 growing, 414  
 pests, 415, 416  
 plot lay out, 600

Mysore, coconuts in, 283

Naphthalene—  
 greenhouse fumigation with, 85  
 control of Japanese beetle, 583

Narcissus bulbs, hot water treatment of, 97, 98

*Nectria galligena*, 220

New Zealand—  
 7th ann. rept. Dept. Sci. Indus. Res. for 1932-33, 308  
 tung oil tree cultivation in, 111

Nicotine supplements in aphid control, 71

Nitrogen, see also Fertilizers, etc.—  
 absorption by apple tree, 37, 194, 195, 196, 197, 348  
 absorption affected by H ion, 351, 364  
 : carbohydrate ratio, 526  
 determination by semi-microanalysis, 350

Nitrogen (continued)—  
 fertilizers for vegetables, 588  
 in orange trees, 434  
 orchard trials of, 345  
 and peach trees, 40, 345, 351  
 and strawberries, 364  
 effect on storage of apples, 342

Northern Spy, rooting habit, 32

Notes on books and reports, 144-149, 303-313, 493-505, 688-696

Nutmeg tree, 469

Nutrition, see also Fertilizers, etc.—  
 cacao, 465  
 chrysanthemum, 603  
 strawberry, 362, 363, 364, 545

Nut(s), see also under particular species—  
 Australian, 59, 555  
 growing in New York State, 60  
 physic, 642  
 Queensland, 59, 555

Nyasaland, report on teagrowing in, 695

Ohanez grape, unproductiveness in, 54

Ohio, horticultural research at Wooster, 506

Oil—  
 essential, 694  
 essential from E. Africa, 490, 491  
 linseed, for control of irregular blossoming, 531  
 for lubricating or motive power, 300, 301  
 olive, 300, 492, 681, 690  
 palm, 124, 281, 282, 622, 649  
 palm fruit rot, 650  
 petroleum, 77, 567  
 producing plants, the poppy, 7  
 production in Africa, 489  
 rancidity tests of olive, 492  
 seal, for control of irregular blossoming, 531  
 spray—  
 accumulation in citrus, 109  
 new developments in citrus, 261  
 for control of irregular blossoming, 531  
 wrappers, 290

Olive—  
 fly, 579  
 insects, 578, 579  
 manual on, 690  
 oil for lubrication, 300  
 oil affected by ripeness, 681  
 oil rancidity tests, 492  
 picking by machine, 542  
 propagation, 28  
 pruning, 539, 540  
 ripening affects oil quality, 681  
 rootstocks, 168  
 storage, 674  
 varietal characters, 517

Onions—  
 alkali scorch, 246  
 breeding, 86  
 pink root and bulb rot, 595  
 thrips resistance in, 596

Orange(s)—  
 Bigaradia, 609  
 field experiments, 427  
 flavour affected by rootstock, 254  
 Jaffa, variations in, 607  
 juice deterioration in canning, 682  
 juice affected by ringing, 106

## SUBJECT INDEX

**Orange(s) (continued)—**  
 juice, vitamins in, 435  
 Mandarin, 609  
 maturity and quality of Satsuma, 260.  
 navel, 436, 612  
 nitrogen distribution in, 434  
 quality estimation, 436  
 ringing, 105, 106, 257, 258  
 rootstocks, 254  
 Satsuma, 260  
 sour, 609  
 storage, 481  
 sugar : acid ratio, 436  
 survey on irrigation areas, 259  
 sweet, 609  
 thinning, 613  
 Washington Navel, 436  
 water relations in, 432

**Oregon—**  
 walnut growing in, 57  
 walnut blight in, 223

**Oriental fruit moth, biological control of, 74**

**Oxidase system in Sunbeam peach, 679**

**Ozone as aid to cold storage, 140**

**Packing, processing and fruit products, 141-143, 297-302, 482-492, 677-687**

**Packing—**  
 apparatus, 514  
 apples, 482, 693  
 bananas, 483  
 citrus, 678  
 pears, 141

**Palestine—**  
 apple growing in, 12  
 citrus rootstocks in, 103  
 pomegranate in, 127  
 rept. Dept. Agric. for 1931 and 1932, 147

**Palm—**  
 coconut, *see* Coconut  
 date, 126, 474, 657  
 oil, 124, 281, 282, 622, 649, 650

**Panama disease, 128**

**Papaya propagation, 447**

**Paper mulch trials, 406, 660**

**Paraffin treatment of fruits, 484**

**Parthenium argenteum, 643**

**Pea(s)—**  
 in California, 412  
 fertilizers for canning, 599  
 marsh spot of, 91  
 "sickness", 413

**Peach—**  
 dwarf seedling, 519  
 harvesting, 47  
 leaf curl, 221  
 manuring, 40, 345, 351  
 pruning, 357  
 rootstocks, 168  
 Sunbeam, 679  
 thinning, 357, 538  
 a, non-browning variety, 679

**Pear(s)—**  
 Bartlett, 14, 336, 347  
 biochemistry, 34  
 black spot disease, 64  
 Chojuro, sterility in, 536, 537  
 cytology, 518

**Pear(s) (continued)—**  
 export, 672  
 fertilizers, 16, 347  
 irrigation of Anjou, 198  
 location, effect of, on, 16  
 metaxenia and xenia in, 336  
 orchard management, 14  
 packing, 141  
 pollination, 186, 339, 536, 537  
 propagation, vegetative, 29  
 rootstocks, 29, 168, 327  
 scab, 380  
 storage, 480, 672

**Pecan—**  
 germination affected by X-rays, 372  
 liver spot disease, 224  
 pollination, 58

**Pennsylvania Sta. Hort. Ass. 75th Ann. Meet., 310**

**Peony, tree, seedling production of, 99**

**Peppers—**  
 abnormal fruits and flowers in, 405  
 paper mulch trials with, 406

**Persimmon, Japanese, 174, 442, 443**

**Perthshire, raspberry industry in, 199**

**Pests, *see also* under particular pests and plants**  
 citrus, 304  
 control in Switzerland, 63

**Petroleum oil—**  
 on apple leaves, 567  
 spray, damage from, 77

**pH in water cultures for vines, 366**

**Philippine College of Agriculture, research at, 621**

**Philippine fruits, storage methods, 136**

**Phloxes, summer flowering, 418**

**Phosphate in soil affecting citrus manuring, 614**

**Phosphorus—**  
 absorption by apple trees, 37  
 deficiency and excess in strawberries, 362  
 determination by semi-microanalysis, 350  
 affecting iron availability in pineapple, 477  
 orchard trials, of, 345

**Photosynthesis in apple leaves, 178**

**Phthiriosis of coffee, 451**

**Physic nut, 642**

**Physiological disorders, *see* Diseases, physiological**

**Phytomonas rhizogenes, 375, 376**

**Pigment in tomatoes affected by heat, 139**

**Pigmentation in cacao, 456, 461**

**Pineapple—**  
 field experiments, 662  
 green manuring, 659, 661  
 iron availability in, 477  
 juice prevents discolouration of cut fruit, 680  
 juices, sugar content, 476  
 manurial trials, 124, 133  
 morphology and biochemistry, 132  
 nutrition, 477  
 paper mulching, 660  
 seedling, structure of, 132  
 seed reserves, 132  
 trash, value as green manure, 659

**Plant protection of deciduous fruits, 61-80, 214-233, 373-398, 556-585**

**Planting, some considerations in commercial, 9**

**Plants and plant products in Iraq, 267**

**Plot lay out, *see also* Experiments**  
 mushrooms, 600

## SUBJECT INDEX

### Plum—

- auto-sterility, 337
- bacterial canker, 219
- breeding, 164
- gall mite, 576
- Grand Duke, 326
- gumming, 525
- Japanese, 158
- pollination, 337, 340
- propagation from root cuttings, 27
- rootstocks, 27, 168, 171, 172, 326
- sawfly, 76
- withertip, 381

### *Podosphaera leucotricha*, 65

### Poison plants, fish, 625

### Pollen sterility, 186

### Pollination—

- apples, 42, 43, 185, 186, 335, 341, 561
- bees, value of different, 46, 535
- cacao, 462, 467
- cherries, 44, 45, 534
- pears, 186, 336, 339, 536, 537
- pecans, 58
- plums, 337, 340
- sacks, material for, 338
- and *Sclerotinia Malii* infection, 561
- top fruits, 41, 184
- walnut, 212

### Polyploidy and vitamin C in apple and tomato, 161

### Pomace, uses of, 143

### Pomegranates in Palestine, 127

### *Pomoideae*, origin, 320

### Poppy, classification and importance as oil producer, 7

### Porcupine grafting, 165

### Potassium—

- absorption by apple trees, 37
- deficiency and excess in strawberry nutrition, 382
- determination by semi-microanalysis, 350
- determination in soil, 188
- in orchard soils, 344

### Potatoes, storage of new, 247

### Pot experiments, see Cylinders

### Preservation, see also Storage

- of fruit pulp and juices, 298
- of wood, 150

### Propagation—

- avocado, 447
- budding technique, 323
- bulbs, 604
- cacao, 273, 453, 454, 455
- cherry, 521, 522
- citrus, 608, 610
- coffee, 449, 638
- cotoneaster, 100
- by cuttings, see Cuttings
- by etiolation methods, 124, 279
- flowers, 420
- fruit trees in Malaya, 279
- Hevea*, see Rubber
- implements for budding and grafting, 322
- kapok, 626
- kola, 119
- lemon, 608
- lettuce, 404
- mango, 447, 471, 610

### Propagation (continued)—

- olives, 28
- papaya, 447
- pear rootstocks, 29
- peony, tree, 99
- plant, studies in, 24, 25
- plum, 27
- pomegranates, 127
- ramie, 628
- roses, 249
- rubber, 120, 121, 122, 123, 276, 645
- tea, 124, 635, 636
- trees and shrubs by cuttings, 324
- vegetative, 8, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 100, 119, 120, 121, 122, 123, 124, 127, 165, 166, 167, 168, 171, 249, 265, 273, 276, 279, 322, 323, 324, 367, 420, 447, 449, 453, 454, 455, 471, 520, 521, 552, 604, 608, 626, 635, 636, 638, 645
- vines, 366, 367, 552

### Prune manuring, 345

### Pruning—

- apples, 36, 358, 527
- apricots, 183, 541
- cherry, 182
- lemons, 104
- olives, 539, 540
- peaches, 387
- and root growth, 36
- and sucker formation in cherry, 182
- tea, 269
- tomatoes, 409
- vines, 56, 370
- and water conductivity in apples, 527

### *Prunus*—

- anomalous embryos in, 319
- Avium* chromosome content, 163
- cerasifera* seedlings for breeding, 164
- divaricata*, 171

### *Pseudomonas*—

- Juglandis*, 223, 558
- mors-prunorum*, 219

### Psoriasis, in citrus, 617

### *Puccinia* sp., see Rust

### Pulps, fruit, 298

### Pyrethrum growing, 580

### Quarantine, plant—

- in California, 62
- in world fruit trade, 513

### Queensland nut, 59, 555

### Quinine, blight of *Cinchona* seedlings, 641

### Radiation with quartz lamp, 592

### Raisins—

- seedless, 551
- world trade in, 686

### Ramie, 628

### Raspberry—

- industry in Angus and Perthshire, 199
- crown gall on red, 377
- and loganberry beetle, 226
- moth, 573
- varieties, 359

### Razors for budding and grafting, 322

### Recording affected by size of apple tree, 177

### Red—

- scale on citrus, 110, 440, 441

- spider, a parasite of, 581

## SUBJECT INDEX

Reggio Calabria, roy. res. sta. for essential oils, report for 1929-33, 694  
 Registration of fruit trees in Morocco, 155  
 Renovation of fruit trees by porcupine grafting, 185  
 Report, annual, *see* Annual report  
 Reviews, *see* Notes on books  
*Revue horticole suisse*, special number on fruit-growing, 10  
**Rhagoletis**  
*Cerasi*, 75, 571, 572  
*completa*, 574, 575  
**Ringing**  
 apples, effect on storage, 289  
 oranges, 105, 106, 257, 258  
**Ripening of fruits**  
 effect on, by ethylene, 484  
 effect on, hydron concentration, 179  
**Root diseases of citrus**, 438  
**Root growth**  
 apples, 30, 36, 175, 329, 523  
 cacao cuttings, 453  
 citrus, 428  
 coffee, 450  
 fruit trees, 328, 330, 524  
 under irrigation, 175  
 plum rootstocks, 172  
 affected by pruning, 36  
 rootstock effect on, 329  
 in sandy soil, 524  
 scion influence on, 30  
 in tea cuttings, 636  
**Rooting**  
 of cacao cuttings, 453  
 of cuttings—and moisture, 420  
 habit of Northern Spy, 32  
 scion, 325  
 vine cuttings, 53, 367  
**Root rot of strawberries**, 149, 222, 383, 384, 565  
**Rootstock(s)**  
 almond, 168  
 apple, 30, 32, 169, 170, 176, 177, 329  
 apricot, 168  
 cherry, 33, 173, 521, 522  
 citrus, 103, 168, 253, 254, 430, 608, 609, 610  
 from a genetic point of view, 31  
 influence in apples, 30, 170, 176  
 influence on buckskin disease of cherry, 522  
 intermediate, in apples, 30  
 kaki, 174  
 lemons, 430  
 loquat, 168  
 Mahaleb, 173  
 mango, 610  
 olive, 168  
 orange, 254  
 peach, 168  
 pear, 29, 168, 327  
 plum, 27, 168, 171, 172, 326  
 ripening, effect on, 326  
 root and stem influence of, 170  
 rootgrowth, effect on, 329  
 roses, 93  
 scion rooting, 325  
 standardization through, advocated in Italy, 31  
 vines, 52, 367, 549  
 walnut, 168

**Rose**  
 brand canker of, 421  
 cuttings, 249  
 flower bud, 248  
 morphology of shoots, 248  
 rootstocks, 93  
 shoots, 248, 249  
 varieties, 94  
**Rosette**, little leaf or, 354, 532  
**Rough lemon**, propagation by cuttings, 608  
**Royal horticultural society's gardens**, 1  
**Rubber**  
 budding, 276, 470  
 buddings, 121, 645  
 callus formation, 123, 276  
 clones, 122  
 Guayule, 643  
 latex from clone and seedling, 646  
 plantations, improvement of, 470  
 propagation, 120, 121, 122, 123  
 research board, Ceylon, rept. on work in 1933, 505  
 seedling selection, 644  
**Rubus**  
*macropetalus*, breeding and cytology, 49  
 yellow rust of, 559  
**Russet on apples**, 374  
**Rust**  
 antirrhinum, 96, 602  
 asparagus, 245  
 on coffee, 452  
 on *Rubus*, yellow, 559  
**Salts, soluble**, in vineyards, 205, 207  
**Samples**, size of, in experimental work, 515  
**Sand cultures**  
 peach trials in, 351  
 vegetable experiments in, 81  
**Saskatchewan**, fruit growing in, 11  
**Sap, tracheal**, copper and iron in, 180  
**Sawfly**  
 apple, 228, 392, 393  
 plum, 76  
**Scab**, *see* Apple scab, etc.  
**Scald**  
 spot of apple, 479  
 superficial, of apple, 290  
**Scale insects**  
 on avocado, control of, 620  
 on citrus, control of, 110, 440, 441, 618, 619  
 influence of temperature and humidity on, 440  
**Scion**  
 influence on apple roots, 30  
 influence in citrus, 429  
 rooting, 325  
**Sclerotinia**  
 diseases on plums and apples, 381  
*Mali*, 561  
**Seed treatment with X-rays**, 151  
**Senescence in stored apples**, 289  
**Serdang**, Govt. plantation, experiments at, 124  
**Set of fruit**, *see* Fruit set  
**Shading of coffee**, 124  
*Shorea* sp., 280  
**Shrubs**, flowering, 17  
**Size of tree affecting records of apple roots and stems**, 177

## SUBJECT INDEX

Small fruits, vines, nuts, 48-60, 199-213, 359-372, 543-555  
 Smoke clouds as frost protection, 214  
 Smudging of mangoes, 472  
 Snapdragon, *see Antirrhinum*  
 Sodium—  
     chlorate as a weed killer, 79, 80  
     salts injuring strawberries, 363  
 Soft fruits, bulletin on, 499  
 Soil(s)—  
     alkali, reclamation, 511  
     effect on apple root growth, 329  
     cacao, 463  
     compactness, apparatus for measuring, 510  
     erosion, 270, 445  
     experiments on vegetables, 399  
     heating by electricity, 589, 593  
     injection of fertilizers into, 189  
     lower greensand fruit, in Kent, 692  
     oxidation-reduction potential, 508  
     potash determination in garden, 188  
     relation to fruitgrowing, 508, 509  
     sandy, rootgrowth in, 524  
     soluble salts in vineyard, 205, 207  
     solution affected by cover crops, 38  
     treatment and plant growth, 509  
     vineyard, 205, 547  
*Sphaeropsidales*, 501  
 Sports—  
     citrus, 102  
     colour strains of Delicious apple, 161  
     of Gros Michel banana, 665  
     inducement by vegetative propagation, 8  
 Spray(ing), *see also* under Diseases, etc.  
     aphids, 69, 70, 71  
     apple, 65, 77, 78, 228, 233, 333, 390  
     apple mildew, 65  
     apple scab, 65, 378, 379, 392  
     arsenic, 78, 229, 390, 569  
     bordeaux, 233, 558, 641  
     cherry fruit fly, 571  
     citrus, 109, 261, 439  
     codling moth, 73, 229, 230, 394, 570  
     contact insecticides, 582  
     copper fungicides on cucumber, 243  
     cucumbers, 243  
     damage, 77, 390, 398  
     distribution, measurement of, 566  
     dormant, 69, 70, 389, 573  
     fluorine compounds, 73  
     fungicide-insecticide combinations, 232, 392  
     Japanese beetle, 582  
     lead compounds, 78, 569  
     and light obstruction, 368  
     lime sulphur, 233  
     linseed oil, 531  
     machinery, 385, 386  
     mite control, 67, 576  
     mottle leaf of citrus, 439  
     nicotine supplements, 71  
     nozzles, 385  
     oil, 109, 261, 531, 567  
     paraffin, 398  
     pears, 78, 380  
     pear scab, 380  
     petroleum oil, 77, 567  
     plum gall mite, 576  
     to prevent fruit set, 333

Spray(ing) (*continued*)—  
     to prevent irregular blossoming, 531  
     raspberry beetle, 226  
     residues, 78, 109, 302, 368, 569  
     sawfly, 228, 392, 393  
     seal oil, 531  
     sodium chlorate, 79, 80  
     sulphur fungicides, 568  
     synthetic solvents, 387  
     tar distillate, 69, 70  
     vines, 368  
     walnut blight, 558  
     walnut husk fly, 574  
     weeds, 79, 80  
     woolly aphid, 398  
     zinc sulphate, 439  
 Statistical—  
     analysis, 507  
     method in field trials, 4, 5  
 Stem and root growth affected by pruning, 36  
 Sterilization of bulbs, 424  
 Sterility—  
     apples, 20, 341  
     plums, 337  
*Stethorus punctillum*, 581  
*Stictocephala inermis*, 225  
 Stock, *see* Rootstock  
 Stomata spots on ripening bananas, 130  
 Stone fruits, *see also* particular fruits—  
     bacterial canker in, 219, 557  
 Storage, 135-140, 288-296, 478-481, 669-676  
 Storage—  
     ammonium bicarbonate, effect on orange, 481  
     apples, 288, 289, 290, 291, 292, 478, 479  
         669, 670, 671  
     avocados, 138  
     bruising of apples in, 291  
     cranberry, 673  
     freezing of apples in, 291  
     freezing of fruits and vegetables, 137  
     frozen-pack products, 136  
     fruits, 675  
     fungi on apples in, 292  
     gas, 288, 293  
     gas affecting *Tortrix* larvae, 395  
     grapes, 294, 295  
     impregnation of fruit skins with wax, 135  
     mangoes, 296  
     oil wrappers, 290  
     olives, 674  
     oranges, 481  
     ozone useful in cold, 140  
     potatoes, new, 247  
     pears, 480, 672  
     scald—  
         spot in apples, 479  
         superficial, in apples, 290  
     sulphur dioxide in, 294  
     tomatoes, 293  
     qualities affected by manuring, 342, 343  
     vegetables, 675, 676  
     wax for impregnating fruit skins, 135  
     wrapping pears with copper sulphate  
         treated paper, 480  
 Strawberry—  
     boron deficiency, 363  
     breeding, 50

## SUBJECT INDEX

### Strawberry (*continued*)—

crinkle disease, 217  
cultivation, 149, 361  
daylight, effect of shortening, 545  
" degeneration ", 149  
disease resembling crinkle, 373  
dwarf, 68  
eelworm, 68  
fertilizers, 545  
grading and marking, 202  
insects, 149  
irrigation, 545  
mite, 227  
nutrition, 362, 363, 364, 545  
root rot, 149, 222, 383, 384, 565  
sodium salts, injury by, 363  
virus, 149, 217, 373

Stub removal after budding, 166, 323

Sucker formation in cherries affected by branch pruning, 182

Sultana, fruit bud studies in, 204

### Sulphur—

deficiency and excess in strawberry nutrition, 362  
dioxide for grape preservation, 294  
dust against citrus pests, 441  
injury to glasshouse plants, 422  
affecting iron availability in pineapple, 477

affecting set of fruit, 568

Sumatra, oil palm in, 281, 282

Switzerland, pest and disease control in, 1930-31, 63

Tanganyika, vinegrowing possibilities in, 208

*Taphrina deformans*, 221

### *Tarsonemus*—

*fragariae*, 227  
*latu*s, 67

*pallidus*, 67

Tar distillates for aphid control, 69, 70

### Tea—

*Assamica*, *Thea*, 630  
culture, 306  
cuttings, 636  
gnarled stem canker, 116  
in Indo-China, 631  
layering, 635  
manuring, 115  
manuring; green, 271  
marketing, 306  
in Nyasaland, 695  
pruning, 269  
research institute of Ceylon, 629  
selection, 632, 633, 634  
and soil erosion, 270  
tasters' terms, 683

vegetative propagation, 124, 635, 636

Temperature, effect on plants, 3, 316, 317, 407, 408

### Thinning—

apples, 355, 356  
oranges, 613  
peaches, 357, 538

### Thrips—

banana, 285  
citrus, 262, 441  
onion, 596

### Tomato(es)—

American varieties, 236  
assimilation influenced by light and temperature, 407, 408  
canning, 139  
freezing in transit, 244  
metabolism, 528  
mosaic, 411  
nitrogen absorption by, 195  
physiological disorders, 242  
pigments, effect of heat on, 139  
polyploidy and vitamin C in, 162  
pruning and training, 409  
" puff ", heredity and, 410  
gas storage, 293  
water content, 408

### Topworking—

avocado, 265

by porcupine grafting, 165

*Tortrix* larvae, effect of gas in store on, 395

Tracheal sap, copper and iron in, 180

### Training—

logan and blackberries, 360

tomatoes, 409

Tree fruits, Deciduous, 9-47, 154-198, 318-358, 514-542

Tree hoppers, 225

Trials of hardy fruits at Wisley, 18, 19

### Trinidad—

ann. rept. on cacao research, 504

banana leaf diseases in, 131

citrus orchard sanitation on River Estate, 263

yam experiments in, 114

Triploid apples, egg and zygote sterility in, 20

Tropical agriculture, bibliography of, 503

Tropical crops, 112-134, 267-287, 445-477, 621-668

Tuber root, *see* Derris

Tung oil, cultivation in New Zealand, 111

Turkey, agriculture in Anatolia, 144

Uganda, rept. Dept. Agric. for 1932, 148

*Uncaria Gambir*, 275

Variations due to X-ray seed treatment, 151

Varieties, trials of hardy fruit, at Wisley, 18, 19

Vegetable growing, 81-92, 234-247, 399-416, 586-600

Vegetable(s), *see also* particular plants

cultivation in frames, 234

diseases, 241, 242, 400, 586

effect of iodine on, 239

experiments, sand culture, 81

germination: seedling growth ratio, 83

health and disease in, 586

irradiation, 592

manganese deficiency in, 240

manuring, 235, 587, 588

preservation by freezing, 137

soil heating for, 589

soil experiments at Wisley, 399

storage, 675, 676

for tropics, the Arachacha, 287

### *Venturia*—

*inaequalis*, 65, 378, 379, 392, 560

*pirina*, 380

Vernalization, 316, 317

## SUBJECT INDEX

**Victoria, Aust.**, cherry growing in, 13  
**Vines, see** Viticulture  
**Virus—**  
 bibliography of, 494  
 bitter pit a virus ? 216  
 in citrus, 617  
 crinkle of strawberry, 217  
 crinkle of strawberry, disease resembling, 373  
 false blossom of cranberry, 218  
 insect vectors, 61  
 mosaic of fig, 556  
 mosaic of tomato, 411  
 of strawberry, 149  
**Vitamin(s)—**  
 C in apple and tomato, 162  
 C in citrus juices, 435  
 in mangoes, 473  
**Viticulture—**  
 ampelography, 51, 203  
 chlorine in vine leaf, 207  
 Concord grape pruning, 56, 370  
 coulure, 55  
 court noué, 382  
 currant trade, 686  
 cuttings, 53, 367  
 density and arrangement of vines, 548  
 direct producers, 209, 210  
 economic study in Eastern U.S., 546  
 field experiments, 365, 548  
 flower bud formation in Concord, 206  
 frosted vines, 369  
 fruit bud studies in Sultana, 204  
 internode determination, 366  
 leaf diagnosis, 207, 371  
 manuring, 207, 211, 371  
 Ohanez, unproductiveness in, 54  
 pH needed in water cultures, 366  
 planting systems, 548  
 preservation of grapes, 294, 295  
 propagation, 366, 367, 552  
 pruning affecting growth, 56, 370  
 raisins, 551, 686  
 rootstocks, 52, 367, 549  
 root system, 53  
 seedless grapes, 551  
 soils, 547  
 soluble salts in non-irrigated vineyards, 205  
 soluble salts in irrigated vineyards, 207  
 spray residue affecting light absorption, 368  
 in S.W. Africa, 208  
 sulphur dioxide for preserving grapes, 294  
 table grapes, 550, 551, 552, 553, 554, 691  
 in Tanganyika, 208  
 wood diagnosis, 211  
  
**Walnut(s)—**  
 ash composition affecting yellows, 213  
 bacteriosis or blight, 223, 558  
 costs and practices in Oregon, 57  
 husk fly, 574, 575  
 pollination of Persian, 212  
 yellows, 213  
**Washer, fruit**, 302  
  
**Water—**  
 conductivity in apples, 527, 528  
 hot, treatment of—  
     bulbs, 97, 98  
     strawberries, 68  
 relations in citrus, 432  
 melon, breeding, 48  
 plant for obtaining, in Palestine, 512  
 rootstocks, 168  
 table affecting plum tree gumming, 525  
**Wax** as preserving agent for fruit skins, 135  
**Weather effect—**  
 on fruit crops, 334  
 on navel orange yields, 612  
**Weeds—**  
 eradication by sodium chlorate, 79, 80  
 suppression by fertilizers and chemicals, 303  
**West—**  
 African agriculture, 305  
 Indian inter-colonial fruit and vegetable conference, 1933, 146  
 Western Nut Growers Association proc. 19th Ann. Meeting, 1933, 309  
**Wilt of egg plant**, 90  
**Wind—**  
 breaks for citrus, 611  
 effect on citrus, 433  
**Wines—**  
 fruit, 142  
 preservation by cold, 295  
**Wisley—**  
 fruit trials at, 18, 19  
 R.H.S. Gardens at, 1  
 vegetable trials at, 399  
**Wither tip of plums**, 381  
**Wood—**  
 diagnosis in vines, 211  
 preservative, 150  
**Woolly aphis—**  
 immunity to, 397  
 injury done by control of, 398  
**Wrappers—**  
 impregnated, for fruit storage, 290, 480  
 pliofilm wrapping, 877  
**Wye, journal of the S.E. Agric. Coll.**, 145  
  
**Xenia—**  
 apples, 533  
 pears, 336  
**Xylamon wood preservative**, 150  
**Xyloporosis in citrus**, 616  
**X-ray—**  
 treatment of seed, 151  
 treatment of pecans, 372  
  
**Yams**, cultivation in Trinidad, 114  
**Yellow edge disease**, 149  
**Yellows of walnuts**, 213  
  
**Zinc—**  
 sulphate to control brown rot gummosis in citrus, 108  
 sulphate to control mottle leaf in citrus, 439  
 treatment of little leaf, 354